



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

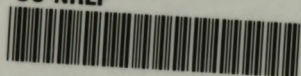
- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

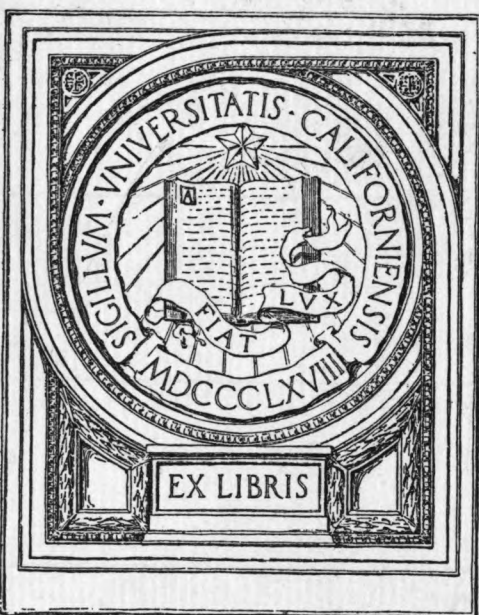
Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

QK
190
V5
no.1-3

UC-NRLF



B 4 314 681



BIOLOGY
LIBRARY
G

1808

Vermont University. Botanical dept.

~~7. C~~
~~1-36~~ *together*

~~Contributions to the Botany of Vermont, I.~~

UNIV. OF
CALIFORNIA

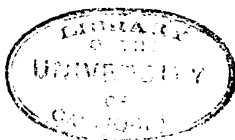
Gift

A LIST OF THE
MOSSES OF VERMONT
WITH ANALYTICAL KEYS TO THE GENERA AND
SPECIES.

BY A. J. GROUT, PH. D.

Published by the Botanical Department of the University of Vermont.

MARCH 15, 1898.



TO VMD
ANNOUNCED

QK190

V5

no.1-3

LIBRARY
G

BIOLOGY
LIBRARY
G

(CORRECTIONS TO ORIGINAL LIST OF MOSSES OF VERMONT.

(These corrections are not paged or indexed and it is suggested that this page be cut up and the corrections properly distributed through the original list.)

Page 5. Section 14 should read as follows :

14.—Teeth articulate. 15.

Teeth not articulate. 37.

And section 17 of the same page should read :

7.—Calyptra plicate. 18.

Page 10, second line, section 2, of key to *Polytrichum*, strike out the word smooth. Note also change of key to species of *Polytrichum*, p. 37.

Page 12, first line of section 11 of key to *Dicranum*, should read "costa 1-5," instead of 1-3.

Page 13. *Dicranum Sauteri* should be stricken from the list as there was a mistake concerning the specimen.

Dicranella heteromalla orthocarpa p. 11, *Dicranum montanum* p. 12, and *Oncophorus gracilescens alpestre* p. 13, are in the herbarium of A. J. Grout and were determined by Professor True.

Page 30. The Vermont moss catalogued as *Hypnum molle* Dicks is *H. dilatatum* Wils. The leaves of *H. dilatatum* are almost orbicular. *H. molle* is a softer plant with leaves more ovate in outline and with shorter leaf cells. It is probable that nearly all the New England plants referred to as *H. molle* are *H. dilatatum*.

Besides the localities previously given *H. dilatatum* has been collected in mountain brooks in Stratton. G.

Page 37. M. Jules Cardot writes as follows concerning the *Fontinalis Sullivantii* from Brattleboro : "The *Fontinalis Sullivantii* from Brattleboro is not the true *F. Sullivantii* of Lindberg. It is the *F. Lescurii* var. *ramosoir* Sulliv. As I have shown in my *Monographie des Fontinalaces*, it is because of an error of Lindberg in citing the plate of Sullivant's *Icones* that Lesquereux and James have taken the var. *ramosoir* for *F. Sullivantii* Lindb. By reading Lindberg's note, it is clearly seen that it is the var. *gracilescens* and not the var. *ramosoir* of which he makes his *F. Sullivantii*. This view is confirmed by an examination of the specimens preserved in his own herbarium."

Page 36. M. Cardot writes that he does not know *F. biformis* from the eastern states so it is possible that the New England plant is something else.

Index—Add the following names and page numbers to index :

Physcomitrium, 37. *Platygyrium*, 35. *Polytrichum*, 37. *Webera*, 19.

Omit page 19 following *Weissia*.

A LIST OF THE MOSSES GROWING IN THE STATE OF VERMONT

WITH ANALYTIC KEYS TO THE GENERA AND SPECIES.

BY A. J. GROUT, PH. D.

INTRODUCTION.

Very little has been published on the moss flora of Vermont since the list of Mr. C. C. Frost in the Archives of Science and Transactions of Orleans County Society of Natural History for 1871. Some of the plants then listed were undoubtedly collected outside of Vermont, as is shown by Mr. Frost's labels, and much new information has been gathered since the date of that publication. Unquestionably there are still many species of mosses growing in the State which have not been collected or listed, and it is hoped that this list will aid and stimulate the study of these humble but interesting plants.

With a few exceptions, which are noted later, no species has been admitted to the list without a careful comparison of Vermont material with descriptions or authentic specimens. Specimens from all of the localities cited, however, have not always been examined. The writer has had access to the collections of Mr. C. C. Frost, Mr. C. G. Pringle, Dr. F. Blanchard and to the Columbia University herbarium, which contains duplicates of the Vermont collections of Messrs. C. E. and E. Faxon and Mrs. E. G. Britton. Mr. Edwin Faxon has also very kindly sent a list of Vermont localities and many rare specimens from the Faxon herbarium.

Mr. Frost, in the list referred to above, published a considerable number of species which are not included in this list because there are no specimens of the omitted species in his

collection. In the autumn of 1866 the New England and Vermont State Agricultural Societies held a union fair at Brattleboro. A diploma was awarded by these societies to Mr. C. C. Frost, "For the Specimens of all the Known Mosses of Vermont." This exhibit is bound in two quarto volumes and is deposited in the Museum of Natural History at Brattleboro, Vt., and all the species of Mr. Frost's collection here listed are represented in that collection.

All specimens of Mr. Pringle's collection will be found in his herbarium and the greater part will be found also in the herbaria of the University of Vermont and of A. J. Grout. Most of Mr. Faxon's collections will be found in the herbarium of the University of Vermont and in the Columbia University herbarium; all of those not found there will be found in Mr. Faxon's private collection and many of the rarer ones not at Columbia have been very kindly communicated to the author by Mr. Faxon. Mrs. Britton's collections are in the Columbia University herbarium, also many will be found in the herbarium of A. J. Grout. Duplicates of nearly all of Dr. Blanchard's mosses are in the herbarium of the Fairbanks' Museum, St. Johnsbury, Vt. The mosses collected by the author will be found in his private herbarium and duplicates of all the species will be found in the herbarium of the University of Vermont.

Localities and habitat have been given as fully as possible. Many of the mosses for which only a very few localities are given are undoubtedly common, but have not been collected often enough to warrant that statement.

Keys to the genera and species listed have been added with the hope that they may be found of material assistance to those who wish to study our Vermont moss flora. The keys are comparatively simple because of the small number of genera and species listed. They are mainly compiled from Barnes, Braithwaite, and Husnot.

The arrangement of the acrocarpous mosses follows Lindberg and Braithwaite with one or two unimportant exceptions. The arrangement of the pleurocarpous mosses is less satisfactory

as there is no recent authoritative publication including all of this group. The arrangement of the species in genera follows, so far as is possible, the recent monographs and an attempt has been made to arrange the families according to their natural relationships. Any student of North American mosses knows how great is the confusion in the systematic arrangement of the pleurocarpous mosses. As the present list is not written for the purpose of promulgating any new system of classification but as an aid to the study of our more common mosses, it is hoped that the discrepancies in this line will be condoned as a necessary evil.

With the exception of the species under the genus *Hypnum* the nomenclature is believed to conform to the Rochester Code. In that composite genus the nomenclature of the Manual of the Mosses of North America of Lesquereux and James is retained on account of the changes which must necessarily follow a revision of this group, and also because of the author's decided opinion that a list of this sort is not the place for the publication of a new systematic arrangement. Whenever the name of a plant has been materially changed, the Manual synonym is inserted in italics.

Dr. G. N. Best has very kindly revised the MS. for the Leskeaceae. My thanks are also due to Prof. L. R. Jones, Miss Martha G. Tyler (Mrs. M. H. Buckham), Mr. E. Faxon, Mr. C. G. Pringle, Mrs. E. G. Britton, Mr. M. A. Howe, and others for assistance and encouragement in the preparation of this list.

As the list is provisional and necessarily incomplete, additional data will be gratefully received.

A. J. G.

State Normal School,
Plymouth, N. H.,
Nov., 1897.

ABBREVIATIONS.

B—Mrs. E. G. Britton.*Bl*—Dr. F. Blanchard.*F*—Edwin Faxon and C. E. Faxon.*Fr*—C. C. Frost.*G*—A. J. Grout.*P*—C. G. Pringle.MOSSES INSERTED ON THE AUTHORITY OF C. C. FROST'S
COLLECTION WITHOUT EXAMINATION.

<i>Ditrichum pallidum.</i>	<i>Thelia asprella.</i>
<i>Barbula fallax brevifolia.</i>	<i>Thelia hirtella.</i>
<i>Barbula convoluta.</i>	<i>Homalothecium subcapillatum.</i>
<i>Grimmia Olneyi.</i>	<i>Rhynchostegium serrulatum.</i>
<i>Grimmia Doniana sudetica.</i>	<i>Hypnum cuspidatum.</i>
<i>Mnium rostratum.</i>	<i>Hypnum molluscum.</i>
<i>Mnium hornum.</i>	<i>Heterocladium squarrulosum.</i>
<i>Leptodon trichomitrium.</i>	<i>Physcomitrium pyriforme.</i>

KEY TO THE GENERA.

- 1.—Leaves composed of large hyaline cells with intervening rows of small chlorophyllose cells.* Sphagnum.

Leaves with cells all alike except variations in shape and size. 2.

- 2.—Fruit terminating the axis of stem, or becoming apparently lateral through being pushed aside by a new shoot. MUSCI ACROCARPI.

Fruit lateral, not terminating the axis of stem.

MUSCI PLEUROCARPI.

(See p. 22 for key to Musci Pleurocarpi.)

MUSCI ACROCARPI.

- 3.—Capsule opening by 4-6 valves connivent at the summit. Andreaea.

Capsule without operculum, opening by irregular transverse ruptures. (Phascum and Bruchia which belong here have been reported from Vermont by Frost, but no specimens have been found in his collection.)

Capsule with a deciduous operculum. 4.

- 4.—Stem none or very short; peristome consisting of a membrane. 5.

Stem distinct; peristome none or formed of separate teeth. 6.

* *Vide also Leucobryum.*

- 5.—Capsule pedicellate, exserted. *Buxbaumia*.
 Capsule sessile, not exceeding the hair-pointed perichaetial leaves. *Webera*.
- 6.—Peristome formed of four thick teeth. *Georgia*.
 Peristome formed of more than four teeth. 13.
 Peristome none. 7.
 8.
- 7.—Leaves ecostate. 9.
 Leaves costate.
- 8.—Annual, from a persistent protonema; capsule long-pedicellate. *Schistostega*.
 Perennial; capsule immersed. *Hedwigia*.
- 9.—Leaf cells elongated. *Physcomitrium*.
 Leaf cells isodiametric. 10.
- 10.—Capsule ribbed when dry. *Anoetangium*.
 Capsule not ribbed when dry. 11.
- 11.—Leaves obovate-oblong, subspatulate, margins plane. *Poëtia*.
 Leaves lanceolate, margins more or less rolled. 12.
- 12.—Upper leaf-cells empty and clearly defined. *Barbula*.
 Upper leaf-cells minute, opaque. *Mollia*.
- 13.—Peristome single. 14.
 Peristome double. 39.
- 14.—Teeth articulate. 15.
 Teeth not articulate. 31.
- 15.—Teeth 16. 16.
 Teeth 32. 20.
- 16.—Calyptra mitrate. 17.
 Calyptra cucullate. 22.
- 17.—Calyptra plicate. 19.
 Calyptra not plicate. 18.5.
- 18.—Lower median leaf-cells linear; hairs of calyptra flexuose. *Weissia*.
 Lower median leaf-cells hexagono-rectangular; hairs of calyptra straight. *Orthotrichum*.
- 18.5.—Leaf cells small, quadrate and punctate, obscure; seta without prominent apophysis. 19.
 Leaf cells large, very distinct; seta with a prominent apophysis. *Tayloria*.
- 19.—Calyptra cylindric; beak long-clavate. *Leersia*.
 Calyptra not cylindric; beak long or short, not clavate. *Grimmia*.
- 20.—Teeth from a high tessellated membrane. *Tortula*.
 Teeth from a narrow membrane. 21.
- 21.—Areolation lax and hyaline at base, minute, obscure and chlorophyllose above. *Mollia*.
 Areolation small, rectangular and slightly hyaline at base, incrassate, rotundate or quadrate and well defined above. *Barbula*.

- 22.—Leaves distichous. 23.
 Leaves pluriseriate. 24.
 23.—Leaves subulate. Swartzia.
 Leaves broader, lamina with an extra division at base. Fissidens.
 24.—Capsule unsymmetric, cernuous-inclined or arcuate. 25.
 Capsule symmetric, erect. 30.
 25.—Teeth irregularly lacerate or bifid to the middle or below. 26.
 Teeth bifid almost to the base.* Ceratodon.
 26.—Leaf cells not enlarged at basal angles, roundish or quadrate above. 27.
 Leaf cells not enlarged at basal angles, oblong above, rectangular at base. 29.
 Leaf cells enlarged-quadrate at basal angles. 28.
 Leaf cells of 2 kinds in 2 or 3 layers. Leucobryum.
 27.—Leaves narrow, acuminate, basal cells rectangular; peristome = $\frac{1}{2}$ capsule. Oncophorus.
 Leaves larger, acute, lower lateral cells quadrate; peristome shorter. Dichodontium.
 28.—Leaf cells linear at base; capsule not strumose. Dicranum.
 Leaf cells rectangular at base, capsule strumose. Oncophorus.
 29.—Costa broad, flattened and indistinct below; cells of exothecium irregularly oblong and curved, with flexuose walls. Dicranella.
 Costa narrow and well defined below; cells of exothecium regularly rectangular-quadrate, with non-flexuose walls. Anisothecium.
 30.—Teeth bifid to the common membranous base. 31.
 Teeth deeply bifid or cleft to the base, free. 32.
 Teeth cribose, perforate or slightly cleft.** 33.
 Teeth entire. 34.
 31.—Leaves smooth, naked. Ditrichum.
 Leaves smooth, covered at back with a glaucous granular-filamentose excretion. Saelania.
 32.—Leaf cells not enlarged at the angles, oblong above. Dicranella.
 Leaf cells not enlarged at the angles, roundish or quadrate above. Oncophorus.
 Leaf cells enlarged, quadrate or rectangular at the angles. Dicranum.
 33.—Seta little exceeding the often hair-pointed leaves. Grimmia.
 Seta long; leaves not hair-pointed. Barbula rubella and Mollia tenuirostris.
 34.—Capsule with a long, thick apophysis. Tetraplodon.
 Capsule without apophysis. 35.
 35.—Capsule short-pyriform, turbinate when dry. 36.
 Capsule ovate-globose. Drummondia.
 36.—Teeth of peristome blunt. Seligeria.
 Teeth acute. Blindia.

*Trematodon belongs here.

**Blindia acuta may be sought here.

- | | |
|---|---------------|
| 37.—Leaves undulate-crisped when dry. | Catharinea. |
| Leaves not undulate-crisped when dry. | 38. |
| 38.—Capsule 4-6-angled. | Polytrichum. |
| Capsule not angular. | Pogonatum. |
| 39.—Capsule symmetric, erect. (Sometimes inclined in age.) | 40. |
| Capsule unsymmetric, inclined, oblique, or pendent. | 43. |
| 40.—Teeth perfect, linear or filiform. | 41. |
| Teeth broadly or narrowly triangular-lanceolate. | 42. |
| 41.—Leaves ecostate; aquatic, floating. | Fontinalis. |
| Leaves costate; not aquatic. | Leersia. |
| 42.—Lower median leaf-cells linear; hairs of calyptra flexuose. | Weissia. |
| Lower median leaf-cells hexagono-rectangular; hairs of calyptra straight. | Orthotrichum. |
| 43.—Leaves linear. | Leptobryum. |
| Leaves lanceolate or broader. | 44. |
| 44.—Calyptra inflated-vesiculose; segments shorter than the teeth or rudimentary. | Funaria |
| Calyptra not inflated-vesiculose; segments nearly equaling teeth in length. | 45. |
| 45.—Capsule striate. | 46. |
| Capsule smooth. | 49. |
| 46.—Capsule subglobose. | 47. |
| Capsule elongated. | 48. |
| 47.—Branches not fascicled; synoicous or monoicous. | Bartramia. |
| Branches fascicled; dioicous with male flowers discoid. | Philonotis. |
| 48.—Leaves coarsely serrate to middle; autoicous. | Orthopyxis. |
| Leaves serrulate near apex only; dioicous. | Gymnocybe. |
| 49.—Seta straight. | Meesea. |
| Seta arcuate at summit. | 50. |
| 50.—Cilia appendiculate (in all our species). | Bryum. |
| Cilia not appendiculate. | 51. |
| 51.—Leaves lanceolate; leaf-cells narrowly rhombic-hexagonal inclining to linear. | Pohlia. |
| Leaves oblong, ovate to obovate or broader; cells round-hexagonal. | Mnium. |

SPHAGNUM Dill. BOG MOSS. PEAT MOSS.

All the species of this genus grow in wet boggy places.

- 1.—Cuticular cells of stem and pendent branches fibrillose as in the large leaf-cells; branch leaves scabrous at the back of apex. 2.
- Cuticular cells of stem and branches not fibrillose; branch leaves not scabrous at the back of apex. 3.
- 2.—Chlorophyllose cells of branch leaves (in cross section) exposed on the inner surface. cymbifolium.

- Chlorophyllose cells of branch leaves included. medium.
- 3.—Branch leaves more or less secund. subsecundum.
- Branch leaves equally spreading. 4.
- 4.—Stem leaves not bordered; branch leaves squarrose. squarrosam.
- Stem leaves broadly bordered with narrow cells; branch leaves erect-open. 5.
- 5.—Branch leaves with very large pores. 6.
- Branch leaves with very small pores. 8.
- 6.—Stem leaves lacerate fringed at apex, with completely reabsorbed cell-membranes in upper part, without fibrils. *Girgensohnii*.
- Stem leaves usually dentate at apex, nowhere with completely reabsorbed cell-membranes. 7.
- 7.—Branch leaves five-ranked when dry. *quinquefarium*.
- Branch leaves not five-ranked when dry. *acutifolium*.
- 8.—Pendent branches concealing the stem; cuticular cells thin and indistinct; cells of border of stem leaves rather short. *recurvum*.
- Pendent branches not concealing the stem; cuticular cells distinct; cells of border of stem leaves narrow and elongated. *cuspidatum*.
- S. acutifolium** Ehrh. In swampy places everywhere.
- The reddish purple form is frequent and is probably *var. purpureum* Schimp.
- S. cuspidatum** Ehrh. Branch Pond, Sunderland, G.
- S. cuspidatum Torreyi** (Sulliv.) Braith. Muddy Pond Woods, West Roxbury, Vt., July 15, 1881, P.
- The stem leaves of Mr. Pringle's specimens are fibrillose above; otherwise they answer to Braithwaite's figure and description with great exactness.
- S. cymbifolium** (Ehrh.) Hedw. Frequent. Monkton and Starksboro, P; Mt. Mansfield and Burlington, G.
- S. Girgensohnii** Russ. (*S. strictum* Lindb.) Not rare. Mt. Mansfield, P; Smuggler's Notch and Burlington, G.
- S. medium** Limpr. *var. laeve* Warnst. Near Willoughby Lake, F. (Det. Warnstorf.)
- S. quinquefarium** (Braith.) Warnst. (*S. acutifolium quinquefarium* Braith.) Stowe, B.
- S. quinquefarium viride** Warnst. Cliffs of Mt. Hor, Willoughby Lake, F.
- S. recurvum** (P. Beauv.) R. & W. *var. parvifolium* Warnst. Stowe, Vt., B. (Det. Warnstorf.)
- S. squarrosam** Pers. Frequent.
- S. subsecundum** Nees. Colchester, P.

MUSCI ACROCARPI.

Section I. SCHISTOCARPI.

Family I. ANDREAEACEAE.

ANDREAEA Ehrh.

A. petrophila Ehrh. Rocks, summit of Mt. Mansfield, P., G.

Section II. STEGOCARPI.

Family II. BUXBAUMIACEAE.

BUXBAUMIA Haller.

B. aphylla L. On the ground near stumps in the woods. Brattleboro, Fr.

Family III. GEORGIACEAE.

GEORGIA Ehrh.

G. pellucida (L.) Rabenh. (*Tetraphis pellucida* Hedw.) Very common on decaying wood.

Family IV. POLYTRICHACEAE.

CATHARINEA Ehrh.

Dioicous; leaves with apex obtuse, densely areolate, margins serrate only in upper half. angustata.Paroicous; leaves with apex acute, more laxly areolate, margins serrate throughout. undulata.**C. angustata** Brid. (*Atrichum angustatum* Br. & Sch.) Cambridge and Charlotte, P.; Johnson, G.**C. undulata** (L.) Web. & Mohr. (*Atrichum undulatum* Beauv.) On the ground in moist shady places; very common.

POGONATUM P. Beauv.

1.—Stems somewhat branched or dendroid; terminal cell of the lamellae ovoid, papillose. 2.Stems simple or innovations axial; terminal cell of the lamellae rectangular, papillose. capillare.Stem simple, very short; leaves radical; protenema persistent. tenue.2.—Plants dark green; capsules smooth. alpinum.Plants glaucous; capsules papillose. uringerum.

- P. alpinum** (L.) Roehl. On the ground in alpine and subalpine regions.
Mt. Hor, *F.*; Mt. Mansfield, *P.*; Brookline, *G.*
- P. capillare** (Michx.) Brid. On the bare soil. Mt. Mansfield, *P.*, *G.*
- P. tenue** (Menzies) E. G. Britton. (*P. brevicaulis* Brid.) On bare clayey soil; frequent, especially in mountainous regions.
- P. urnigerum** (L.) Beauv. On the ground. Peacham, *Bl.*; Mt. Mansfield, *P.*; Newfane, *G.*

POLYTRICHUM L. HAIR CAP MOSS.

- | | |
|--|----------------------|
| 1.—Leaves entire with an inflexed margin. | 2. |
| Leaves sharply serrate, plane. | 4. |
| 2.—Leaves long awned; awn rough, hyaline. | <i>piliferum</i> . |
| Leaves short awned; awn smooth, colored. | 3. |
| 3.—Stems short; leaves spreading, recurved; capsule square, prismatic. | <i>juniperinum</i> . |
| Stems tall; leaves erect-open, straight; capsule small, cuboid. | <i>strictum</i> . |
| 4.—Capsule cubical, calyptra covering it to its base. | <i>commune</i> . |
| Capsule tapering into the seta, calyptra shorter. | <i>Ohioense</i> |
- P. commune** L. Common Hair Cap Moss. Abundant everywhere and a great pest in old meadows where it often entirely supplants the grass over large areas.
- P. juniperinum**. Willd. On the ground; not rare. Peacham, *B.*; Newfane, *G.*
- P. Ohioense** R & C. Mt. Mansfield, D. C. Eaton, *P.*, *G.*
This is the plant from the Eastern United States which has usually been referred to *P. formosum* Hedw.
- P. piliferum** Schreb. In dry open places; frequent.
- P. strictum** Banks. Abundant in boggy places near the summit of Mt. Mansfield and probably on all the higher mountains.

Family V. FISSIDENTACEAE.

FISSIDENS Hedw.

- | | |
|--|-----------------------|
| 1.—Plants terrestrial or submersed but not floating. | 2. |
| Plants aquatic, filiform, floating. | <i>Julianus</i> . |
| 2.—Fruit terminal. | 3. |
| Fruit lateral. | 4. |
| 3.—Leaves not bordered. | <i>osmundioides</i> . |
| Leaves bordered. | <i>bryoides</i> . |
| 4.—Autoicous; leaf cells distinct. | <i>adiantoides</i> . |
| Dioicous; leaf cells obscure. | <i>cristatus</i> . |

- F. adiantoides** (L.) Hedw. On rocks and soil in wet or swampy places. Hinesburgh, *P.*; Willoughby Lake region, *F.*; Salisbury, Eggleston.
- F. bryoides** (L.) Hedw. On the ground and shaded rocks. Brattleboro, *F.*; Smuggler's Notch, *P.*
- F. cristatus** Wils. (*F. decipiens* De Not.) On rocks, soil and decaying wood in swamps or wet places; common.
- F. Julianus** (Savi) Sch. (*Conomitrium Julianum* Mont.) Connecticut River, near Brattleboro, *F.*
- F. osmundoides** (Swtz.) Hedw. On the ground; in swamps and on wet rocks. Willoughby Lake and Starksboro, *P.*; Outlet of Lake of Clouds, Mt. Mansfield, *G.*; near Joe's pond, W. Danville, *Bl.*; Mt. Hor, *F.*

Family VI. LEUCOBRYACEAE.

LEUCOBRYUM Hampe.

- L. glaucum** (L.) Sch. (*L. vulgare* Hampe.) In dense whitish cushions on the ground in woods and moist places; common.

Family VII. DICRANACEAE.

ANISOTHECIUM Mitt.

- A. rubrum** (Huds.) Lindb. (*Discranella varia*, Schimp.) Damp soil and rocks. Brattleboro, *Fr.*; Mt. Mansfield, *P.* & *G.*; Peacham, *Bl.*

BLINDIA Br. & Sch.

- B. acuta** (Huds.) Br. & Sch. Willoughby Lake and foot of Mt. Hor cliffs, *F.*

CERATODON Brid.

- C. purpureus** (L.) Brid. On soil, rocks, banks, etc.; common and variable.

DICHODONTIUM Sch.

- D. pellucidum** (L.) Sch. var. **Americanum** Lesq.. Brattleboro, *Fr.*; *Vide.* Lesq. & James, Mosses of N. A. 62.

DICRANELLA Schimp.

- D. heteromalla** (Dill. L.) Sch. Moist banks and rocks, especially in mountain regions. *Vide* Bull. Torr. Club. 22: 450. 1895.
- D. heteromalla orthocarpa** Hedw. Mt. Mansfield, *P.*

DICRANUM Hedw.

- | | |
|---|---------------|
| 1.—Capsule erect, symmetric. | 7. |
| Capsule cernuous, arcuate. | 2. |
| 2.—Leaf cells pitted. | 3. |
| Leaf cells not pitted or only faintly so. | 5. |
| 3.—Leaves mostly transversely undulate. | 4. |
| Leaves not undulate. | 6. |
| 4.—Upper leaf cells elongated; capsules clustered. | undulatum. |
| Upper leaf cells isodiametric; capsules solitary. | Bergii. |
| 5.—Leaves little or not at all secund, strongly crispate when dry, upper cells irregular. | |
| Leaves secund, not crispate, upper cells regular. | Muhlenbeckii. |
| Leaves secund, not crispate, upper cells regular. | fuscescens. |
| 6.—Tufts loose; longitudinal lamellæ at back of costa dentate. | scoparium. |
| Tufts compact; costa dentate at summit, without lamellæ. | Muhlenbeckii. |
| 7.—Margin of leaves entire, apex usually broken. | viride. |
| Margin serrate or at least denticulate near apex. | 8. |
| 8.—Costa excurrent. | 10. |
| Costa vanishing at the serrulate apex. | 9. |
| 9.—Subulate apex short, papillose at back. | montanum. |
| Subulate apex elongated, smooth at back. | flagellare. |
| 10.—Leaves erect or subsecund, crispate when dry. | fulvum. |
| Leaves falcate-secund, not crispate when dry. | 11. |
| 11.—Costa $\frac{1}{2}$ width of base; leaves gradually narrowed into a subulate point. | Sauteri. |
| Costa $\frac{1}{2}$ width of base; leaves suddenly narrowed into a very long setaceous point. | longifolium. |

D. **Bergii** Bland. Peacham, *Bl.*

D. **flagellare** Hedw. Rotting wood in shady places; not uncommon.

D. **fulvum** Hook. On rocks in shady places. Manchester, *G.*; Stowe, *B.*

D. **fuscescens** Turn. On rocks and decayed wood in moist places; frequent in mountainous regions.

D. **longifolium** Ehrh. Devil Hill, *Bl.*; Mt. Mansfield, *B.*; Willoughby Mt. and Jay Peak, *F.*

D. **longifolium subalpinum** Milde. Bare rocks on the "Nose" of Mt. Mansfield, *G.* (Det. R. H. True.) The only known locality in the New World.

D. **montanum** Hedw. Carriage road, Mt. Mansfield, *F.*

D. **Muhlenbeckii** Br. & Sch. Rock Point, Burlington, Eggleston. Det. Prof. R. H. True. The Vermont specimens occasionally mature two capsules from one perichætium.

- D. Sauteri** Br. & Sch. Mt. Mansfield, *B.*
- D. scoparium** (L.) Hedw. Shaded banks, rocks and roots of trees; common.
- D. undulatum** Ehrh. On the ground in moist or swampy places. Colchester, Bristol Bog and Monkton, *P.*; Castleton, *G.*; Barnet, *Bl.*; Mt. Hor. and Willoughby Mt., *F.*
- D. viride** (Sull. & Lesq.) Lindb. Mt. Mansfield, D. C. Eaton; specimen in Frost Herb. at Brattleboro. Stowe and Mt. Mansfield, *B.*

DITRICHUM Timm.

Monoicous; seta yellow; costa long excurrent.

pallidum.

Dioicous; seta red; costa subexcurrent.

tortile.

- D. pallidum** (Schreb.) Hampe. (*Leptotrichum pallidum*, Hampe.) Brattleboro, *Fr.*
- D. tortile** (Schrab.) Hampe. (*Leptotrichum tortile*, Muell.) Dry soil; frequent.

ONCOPHORUS Brid.

Capsule strumose.

Wahlenbergii.

Capsule not strumose.

gracilescens.

- O. gracilescens.** (Web. & Mohr.) Lindb. (*Cynodontium gracilescens* Sch.) Mt. Mansfield summit, *G. & P.*
- O. gracilescens alpestre** Schimp. Mt. Mansfield, *P.*
- O. Wahlenbergii** Brid. (*Cynodontium virens* var. *Wahlenbergii* Br. & Sch.) Stowe, *B.*; Mt. Hor & Willoughby Lake, *F.*

SAELANIA, Lindb.

- S. caesia** (Vill.) Lindb. (*Leptotrichum glaucescens* Hampe.) Very dry hills. Peacham, *Bl.*; Brattleboro, *Fr.*; Willoughby, Dr. Kennedy.

SELIGERIA Br. & Sch.

- S. calcarea** (Dicks.) Br. & Sch. Slides, Willoughby Mt., Dr. Geo. G. Kennedy. In herb. U. V. M.

SWARTZIA Ehrh.

- S. montana** (Lamk.) Lindb. (*Distichium capillaceum* Br. & Sch.) Wet crevices of rocks in mountains. Cliffs of Willoughby Mt., *F.*; Mt. Mansfield, *P.*

TREMATODON Mx.

- T. ambiguus** (Hedw) Hornsch. Willoughby Lake, *F.*; Brattleboro, *Fr.* In herb. Frost as *T. longicollis* Mx.

Family VIII. TORTULACEAE.

BARBULA Hedw.

- | | |
|--|----------------------|
| 1.—Peristome lacking. | curvirostris. |
| Peristome present. | 2. |
| 2.—Peristome short, erect. | rubella. |
| Peristome elongated, contorted | 3. |
| 3.—Leaves squarrose-recurved. | fallax |
| Leaves erect-open. | 4. |
| 4.—Leaves with costa vanishing at or below apex. | convoluta. |
| Leaves mucronate with the excurrent costa. | unguiculata. |
- B. convoluta** Hedw. Brattleboro, *Fr.*
- B. curvirostris** (Ehrh.) Lindb. (*Gymnostomum curvirostrum* Hedw.)
Calcareous alpine cliffs. Willoughby cliffs, *F.*; Smugglers' Notch,
and cliffs of L. Champlain, *P.*
- B. fallax** Hedw. Shaded rocks, Winooski River, *P.*
- B. fallax brevifolia** (Sm.) Schultz. Brattleboro, *Fr.*
- B. rubella** (Hoffm.) Mitt. (*Didymodon rubellus* Br. & Sch.) Roadside
Willoughby Lake, and Williamstown Gulf, *F.* Limestone cave
east of High Bridge, Burlington, and Dorset Mt. *G.*; Peacham, *Bl.*;
N. Pomfret, *Fr.*
- B. unguiculata** (Huds.) Hedw. On dry soil and rocks. Manchester, *G.*;
Peacham, *Bl.*; Newport, *F.*; Brattleboro, *Fr.*

LEERSIA Hedw.

- | | |
|--------------------------|-------------------|
| Costa excurrent. | laciniata. |
| Costa vanishing at apex. | contorta. |
- L. contorta** (Wulf.) Lindb. (*Encalypta streptocarpa* Hedw.) Limeston
cave east of High Bridge, Burlington, *G.*
- L. laciniata** Hedw. (*Encalypta ciliata* Hedw.) On rocks in subalpine
regions. Peacham, *Bl.* and *P.*; Willoughby, Mt., and Mt. Hor, *F.*;
N. Pomfret and Brattleboro, *Fr.*

MOLLIA Schrank.

- | | |
|---|------------------|
| 1.—Costa excurrent. | 2. |
| Costa vanishing in or below apex. | 5. |
| 2.—Plants small nearly simple. | viridula. |
| Plants larger, robust, branched or divided. | 3. |

- 3.—Leaves long linear, acute, abruptly mucronate. humilis.
 Leaves very long acuminate, cuspidate. 4.
- 4.—Leaves twisted crispate when dry, of one layer of cells above. tortuosa.
 Leaves not crispate, of two layers of cells above. fragilis.
- 5.—Capsule oval; annulus lacking. aeruginosa.
 Capsule cylindric; annulus of two rows of narrow cells. tenuirostris.
- M. aeruginosa** (Sm.) Lindb. (*Gymnostomum rupestre* Sch.) Cliffs of L. Champlain, *P.*; Rock Point, Burlington, *G.*; Brattleboro, *Fr.* Base of Mt. Hor Cliffs, *F.*
- M. fragilis** (Drumm.) Lindb. (*Barbula fragilis*, Br. & Sch.) Mt. Mansfield, *F.*
- M. humilis** (Hedw.) Braith. (*Barbula caespitosa* Schwaegr.) Brattleboro, *Fr.*; Swamps, Charlotte, *P.*
- M. tenuirostris** (Hook and Tayl.) Lindb. (*Didymodon cylindricus* Br. & Sch.) Rock Point, Burlington, *G.*
- M. tortuosa** (L.) Schrk. (*Barbula tortuosa* Web. & Mohr.) Rocks and banks. Peacham, *Bl.*; Mt. Mansfield summit and Willoughby Lake region, *F.*
- M. viridula** (L.) Lindb. (*Weissia viridula* Brid.) On the ground under various conditions. Mt. Mansfield, *B.*; Hinesburgh, *P.*; Peacham, *Bl.*; Brattleboro, *Fr.*

POTTIA Ehrh.

- P. truncatula** (L.) Lindb. (*P. truncata* Fuern.) On the ground in a pasture. Brattleboro. *Fr.*; Burlington, L. R. Jones.

TORTULA Hedw.

- T. mucronifolia** Schwaegr. Shelburne Point, *P.*

Family IX. WEBERACEAE.

WEBERA Ehrh.

- W. sessilis** (Schmid.) Lindb. (*Diphyscium foliosum* Mohr.) Moist rocks and banks; frequent in mountainous regions.

Family X. GRIMMIACEAE.

ANOECTANGIUM Hedw.

- A. Lapponicum** Hedw. (*Amphoridium Lapponicum* Schimp.) Fissures of rocks. Mt. Mansfield, *P.*

DRUMMONDIA Hook.

D. prorepens (Hedw.) E. G. Britton. (*D. clavellata* Hook.) Trunks of trees, frequent.

GRIMMIA Ehrh.

- | | |
|---|---------------|
| 1.—Capsule immersed. | 2. |
| Capsule exserted. | 3. |
| 2.—Leaf margins plane. | Donii. |
| Leaf margins revolute. | apocarpa. |
| 3.—Leaves ending in a whitish hair. | 4. |
| Leaves not ending in whitish hair. | 7. |
| 4.—Seta arcuate. | Olneyi. |
| Seta straight. | 5. |
| 5.—Areolation sinuose, nodulose-linear throughout. | ramulosa. |
| Areolation roundish quadrate above. | 6. |
| 6.—Autoicous; very short, densely pulvinate; capsule pale. | Donii. |
| Dioicous; taller, laxly tufted; capsule brown. | microcarpa. |
| 7.—Leaf cells all elongated and sinuose. | fascicularis. |
| Upper leaf-cells (at least near apex) quadrate to roundish. | 8. |
| 8.—Leaves narrowly linear-lingulate from an ovate-oblong entire base; lower leaf cells rectangular to quadrate. | unicolor. |
| Leaves broadly ovate-oblong, usually remotely hyaline-dentate above, lower leaf cells linear, sinuose. | acicularis. |
- G. acicularis** (L.) C. Muell. (*Racomitrium acicularis* Brid.) Rocks by brooks. Mt. Mansfield, P.
- G. apocarpa** (L.) Hedw. On rocks, not rare. Smuggler's Notch, P.; Johnson, G.; Brattleboro, Fr.; Willoughby Lake, F.
- G. Donii** Smith. var. **sudetica** (Spreng.) Braith. Old stone walls, Brattleboro, Fr.
- G. fascicularis** (Schräd.) C. Muell. (*Racomitrium fasciculare* Brid.) Mt. Mansfield, P. & G.
- G. microcarpa** (Gmel.) Lindb. (*Racomitrium sudeticum* Brid.) Moist alpine rocks. Mt. Mansfield, P.
- G. Olneyi** Sulliv. On rocks near the Connecticut River, Fr.
- G. ramulosa** Lindb. (*Racomitrium microcarpum* Brid.) On rocks at summit of Mt. Mansfield, P. & G.
- G. unicolor** Hook. Dry rocks, Rock Point, Burlington, G.

HEDWIGIA Ehrh.

H. albicans (Web.) Lindb. (*H. ciliata* Ehrh.) Common on exposed ledges.

- H. albicans leucophaea** Schimp. Willoughby Mt., *F*.
H. albicans viridis Br. & Sch. E. Barnet, *Bl.*; Bluffs of Lake Champlain, Burlington, *G*.

ORTHOTRICHUM Hedw.

- 1.—Capsule long exserted. **anomalum.**
 Capsule immersed or half emergent. 2.
 2.—Leaves obtuse. **Ohioense.**
 Leaves acute. **strangulatum.**
O. anomalum Hedw. Limestone cliffs of Lake Champlain and Willoughby Mt., *F.*; Jonesville, *B*.
O. Ohioense Sull. & Lesq. On trees. Charlotte, *P*.
O. strangulatum Beauv. On trees. Brattleboro, *Fr*.

WEISSIA Ehrh.

- 1.—Leaves rigid, not crisped. **Americana.**
 Leaves crisped when dry. 2.
 2.—Capsule striate only at the contracted orifice. **coarctata.**
 Capsule striate all its length. **ulophylla.**
W. Americana (Beauv.) Lindb. (*Ulota Hutchinsiae* Schimp.) On rocks in subalpine regions; not uncommon. Manchester, *G.*; Smuggler's Notch, Mt. Mansfield, *B.*; Brattleboro, *Fr*.
W. coarctata (Beauv.) Lindb. (*Ulota Ludwigii* Brid.) Trunks of trees; frequent. Peacham, *Bl.*; Underhill and Mt. Mansfield, *P.*; Newfane, *G.*; Stowe, *B.*; Brattleboro, *Fr*.
W. ulophylla Ehrh. (*Ulota crispa* Brid.) On trees; not rare in subalpine regions. Newfane, Manchester, *G.*; Peacham, *Bl.*; Underhill, *P.*; Brattleboro, *Fr*.
W. ulophylla crispula (Bruch.) Hammar. (*Ulota crispula* Brid.) Willoughby Mt., *F.*; Underhill Notch, *G*.

Family XI. SCHISTOSTEGACEAE.

SCHISTOSTEGA Mohr.

- S. osmundacea** (Dicks.) Mohr. Path up Jay Peak, *F*. In herb. Faxon.

Family XII. SPLACHNACEAE.

TAYLORIA Hook.

- T. tenuis** (Dicks.) Schimp. On cow dung in swamp at the top of Mt. Mansfield, Dr. Geo. G. Kennedy. In herb. U. V. M.

TETRAPLODON Br. & Sch.

- T. bryoides** (Zoega) Lindb. (*Tetraplodon mnioides* Br. & Sch.) Bones of hedgehog, Mt. Mansfield summit, *G*.

Family XIII. FUNARIACEÆ.

FUNARIA Schreb.

- F. hygrometrica** (L.) Sibth. On the ground, common.

PHYSCOMITRIUM Brid.

- P. pyriforme** (L.) Brid. On soil, Brattleboro, *Fr*.

Family XIV. BRYACEÆ.

BRYUM. Dill.

- | | |
|---|---------------------|
| 1.—Costa excurrent. | 2. |
| Costa ending in or below apex. | 5. |
| 2.—Leaves bordered. | 3. |
| Leaves not bordered. | 4. |
| 3.—Autoicous. | pallescons. |
| Synoiuous. | bimum. |
| Dioicous; capsule long necked. | pallens. |
| 4.—Synoiuous. | intermedium. |
| Dioicous. | caespitium. |
| 5.—With stolons; leaves large, clustered at summit. | proliferum. |
| Without stolons; leaves scattered. | 6. |
| 6.—Costa extending to apex. | concinatum. |
| Costa ending below apex. | 7. |
| 7.—Leaves distant. | Duvalii. |
| Leaves closely imbricated. | argenteum. |

- B. argenteum** L. Waste ground, in walks and on walls and rocks; common.

- B. bimum** Schreb. Spring opposite Notch House, Smugglers Notch, *B.*; Brattleboro, *Fr.*; swamps, Charlotte, *P.*; Peacham, *Bl.*; brooks in Willoughby Lake region, *F.*; wet cliffs, Castleton, *G.*

- B. caespitium** L. Rocks and dry banks; frequent.

- B. concinatum** Spruce. Mansfield Pass, *P.*. (Det. Lindberg.)

- B. Duvalii** Voit. Rivulets in meadows, Willoughby, *F.*

- B. intermedium** Brid. Shady ground and crevices of rocks. Willoughby Lake region, *F.*



VERMONT MOSSES.

- B. pallens** Swtz. Willoughby Cliffs and Williamstown Gulf, *F.*
B. pallescens Schleich. Cliffs of Mt. Mansfield, *P.*
B. proliferum (L.) Sibth. (*Bryum roseum* Schreb.) On decaying wood and rich earth in moist shady places; common.

LEPTOBRYUM Wils.

- L. pyriform** (L.) Wils. Mt. Mansfield, *P.*; Williamstown Gulf, *F.*; Brattleboro, *Fr.*

POHLIA Hedw.

- 1.—Upper leaves suddenly elongated; neck of capsule equaling sporangium; cilia none or rudimentary. elongata.

Upper leaves broader; neck of capsule shorter than sporangium; cilia well developed. 2.

- 2.—Annulus lacking; dioicous. albicans.

Annulus present. 3.

- 3.—Tufts 2-4 cm. high; basal membrane of endostome $\frac{1}{3}$ - $\frac{1}{2}$ height of teeth; paroicous. nutans.

Tufts 1-2 cm. high; basal membrane $\frac{1}{4}$ height of teeth; polyoicous. cruda.

- P. albicans** (Wahlenb.) Lindb. (*Webera albicans* Sch.) In border of pool, Milton Falls, *G.*; Springy places, Brattleboro, *Fr.*; Jay Peak, *F.*

- P. cruda** (L.) Lindb. (*Webera cruda* Sch.) Mt. Hor, *F.*; Brattleboro, *Fr.*

- P. elongata** Hedw. (*Webera elongata* Schwaegr.) Mt. Mansfield, *P.* and *G.*; Jay Peak, *F.*

- P. nutans** (Schreb.) Lindb. (*Webera nutans* Hedw.) Moist rocky banks and crevices of rocks in mountains. Johnson, *G.*; Mt. Mansfield and Charlotte, *P.*; Jay Peak and Willoughby Lake region, *F.*; Brattleboro, *Fr.*

Family XV. BARTRAMIACEAE.

BARTRAMIA Hedw.

Leaves smooth. Oederi.

Leaves papillose. pomiformis.

- B. Oederi** (Gunn.) Swtz. (*B. Oederiana* Swtz.) Wet shady banks in cold or mountainous regions. Manchester, *G.*; Hinesburgh and Cliffs of Mt. Mansfield, *P.*; Mt. Hor, *F.*; Woodstock, Miss C. G. Soule.

- B. pomiformis** (L.) Hedw. Wet shady banks and fissures of rocks.
Manchester, *G.*; Peacham, *Bl.*; Mt. Hor, *F.*; Hinesburgh, *P.*;
Woodstock, Miss Soule.

PHILONOTIS Brid.

- P. fontana** (L.) Brid. Wet rocks; frequent.

A careful study of all accessible material indicates that the Vermont specimens of *Philonotis* are all *P. fontana*.

Family XVI. MEESEACEAE.

MEESEA Hedw.

- M. triquetra** (L.) Aongst. (*M. tristicha* Br. & Sch.) Shelburne Pond Bog, *P.*

Family XVII. MNIACEAE.

GYMNOCYBE Fries.

- G. palustris** (L.) Fries. (*Aulacomnium palustre* Schwaegr.) Cool, boggy places; frequent but rarely fruiting.

MNIUM Dill. L.

- | | |
|--|----------------------------|
| 1.—Leaves not bordered | stellare. |
| Leaves bordered. | 2. |
| 2.—Margin biserrate. | 4. |
| Margin serrate with solitary teeth. | 8. |
| Margin entire. | 3. |
| 3.—Leaves costate to apex, upper leaf cells longer than broad. | punctatum. |
| Costa vanishing, upper leaf cells isodiametric. | hymenophylloides. |
| 4.—Costa vanishing below apex. | hornum. |
| Costa reaching apex. | 5. |
| 5.—Capsules clustered. | spinulosum. |
| Capsules solitary. | 6. |
| 6.—Synoicous. | marginatum. |
| Dioicous. | 7. |
| 7.—Costa excurrent in upper leaves; leaf cells .018—.030 mm. | pseudolycopodoides. |
| Costa percurrent; leaf cells about .015 mm. | orthorhynchum. |
| 8.—Basilar branches stoloniform. | 9. |
| Basilar branches erect or stems simple. | Drummondii. |
| 9.—Leaves rounded at apex, mucronate; operculum rostrate. | rostratum. |
| Leaves acuminate. | 10. |

10. — Leaves serrate to middle: sylvaticum.
 Leaves serrate to base. 11.
11. — Leaves slightly decurrent, obovate-oblong. cuspidatum.
 Leaves very long decurrent, oblong. ciliare.
- M. cuspidatum** (L.) Neck. (Non Hedwig.) (*Mnium affine* Bland.) On decaying wood, Peacham, *Bl.*; on soil, Mt. Mansfield, *G.*; Brattleboro, *Fr.*; Willoughby Lake, *F.*
- M. ciliare** (Grev.) Lindb. Cold Brook, Willoughby, *F.* (Det. E. G. Britton.)
- M. Drummondii** Br. & Sch. Near Willoughby Lake, *F.*; Woodstock, Miss Soule.
- M. hymenophylloides** Hueben. Base of Mt. Hor Cliffs, *F.*
- M. hornum**, L. Brattleboro, *Fr.*
- M. marginatum** (Dicks.) Beauv. (*M. serratum* Laich.) Rock Point, Burlington, *G.*; Mt. Hor, *F.*; Smuggler's Notch, Eggleston.
- M. orthorrhynchum** Br. & Sch. On the ground and in wet places. Mt. Mansfield region and Monkton, *P.*; Mt. Hor, *F.*
- M. pseudolycopodioides** C. M. & Kindb. (*M. lycopodioides*. L. & J. non Schwaegr.) Mt. Hor, *F.*
- M. punctatum** L. var. **elatum** Schimp. On the ground in cool wet places; frequent. Belden Pond, Johnson, *G.*; Brattleboro, *Fr.*
- M. rostratum** Schrad. Woodland rivulets. Brattleboro, *Fr.*
- M. spinulosum** Br. & Sch. Woods, Peacham, *Bl.*; Rock Point, Burlington, *G.*
- M. stellare** Reich. On the ground and rotting wood in moist shady places. Hinesburgh, *P.*; Peacham, *Bl.*; Mt. Hor and Williamstown Gulf, *F.*; Brattleboro, *Fr.*
- M. sylvaticum** Lindb. (*M. cuspidatum* Hedw.) On rocks, soil and roots of trees; in wet shady places. Monkton and Burlington, *P.*; Peacham, *Bl.*; Mt. Hor and Willoughby, *F.*; Newfane, *G.*; Brattleboro, *Fr.*

ORTHOPYXIS P. Beauv.

- O. heterosticha** (Hedw.) P. Beauv. (*Aulacomnium heterostichum*. Br. & Sch.) Base of trees in moist woods, Newfane, Manchester, *G.*; Brattleboro, *Fr.*

MUSCI PLEUROCARPI.

1.—Internal peristome latticed; aquatic.	Fontinalis.
Internal peristome not latticed.	2.
2.—Leaves strongly papillose.	25.
Leaves not papillose or very slightly so by reason of the thickening of angles of the cell walls.	3.
3.—Peristome single.	4.
Peristome double, the inner often imperfect.	6.
4.—Leaves distichous, lamina with an extra division at base.	Fissidens.
Leaves pluriseriate.	5.
5.—Leaves ecostate.	Leucodon.
Leaves costate.	Leptodon.
6.—Segments short or none or obscured by adhering to the teeth.	7.
Segments narrowly linear, often indistinctly keeled.	10.
Segments lanceolate, distinctly keeled.	11.
7.—Capsules straight.	8.
Capsules more or less curved.	Homalothecium
8.—Segments adherent to the teeth.	9.
Segments not adherent to the teeth.	Neckera.
9.—Leaves costate.	Homalothecium.
Leaves ecostate or costa short and double.	Pylaisiella.
10.—Leaves costate, costa single.	Anacamptodon.
Leaves ecostate or costa short and double.	Entodon.
11.—Capsule symmetric, erect.	12.
Capsule unsymmetric, often arcuate, more or less inclined.	14.
12.—Costa single, extending to the middle or beyond.	13.
Costa short and double or none.	Entodon.
13.—Plants dendroid.	Climacium.
Plants not dendroid, creeping; leaves complanate, pseudodistichous.	Homalia.
14.—*Leaf cells short 1:3 or less.	15.
Leaf cells 1:3 or more.	16.
15.—Plants stout, dendroid; leaves coarsely serrate.	Porotrichum.
Plants slender, creeping; leaves entire or denticulate above.	Amblystegium.
16.—Costa single, extending to middle of leaf.	17.
Costa short and double or none.	22.
17.—Operculum long-rostrate.	18.
Operculum conic or very short-rostrate.	19.
18.—Stem leaves deltoid or else papillose by the thickened angles of the cell walls.	Eurhynchium.

**Brachythecium reflexum* will be sought here.

- Stem leaves ovate or ovate-lanceolate, smooth. Rhynchostegium.
 Stem and branch leaves very concave, spoon-shaped. Myuroclada.
- 19.—Leaves not secund or obtuse. 20.
 Leaves secund or obtuse. Hypnum.
- 20.—Capsule short, erect to horizontal, usually somewhat arcuate and contracted under the mouth when dry. 21.
 Capsule longer, very strongly arcuate and contracted under the mouth when dry. Amblystegium.
- 21.—Leaves deeply plicate lengthwise; stems often covered with felted radicles; plants a bright glossy yellow-green. Campthothecium.
 Leaves little or not at all plicate; stems not covered with felted radicles; plants less glossy. Brachythecium.
- 22.—Leaves secund. Hypnum.
 Leaves complanate. Plagiothecium.
 Leaves equally spreading. 23.
- 23.—Lid long subulate-rostrate. Raphidostegium.
 Lid conic or short-rostrate. 24.
- 24.—Plants small and slender. Amblystegium.
 Plants large and robust. Hylacomium and Hypnum.
- 25.—Peristome double but segments none or short. 26.
 Peristome double, segments narrowly linear, indistinctly keeled. 28.
 Peristome double, segments lanceolate, distinctly keeled. 29.
- 26.—Leaves entire, ovate to ovate-lanceolate. 27.
 Leaves spinulose-dentate to fimbriate, deltoid or round ovate. Thelia.
- 27.—Teeth of peristome ciliate papillose. Leskea.
 Teeth of peristome not ciliate papillose. Anomodon.
- 28.—Stem and branch leaves similar. Leskea.
 Stem leaves much smaller than branch leaves. Anomodon.
- 29.—Capsule symmetric, erect. Myurella.
 Capsule unsymmetric, arcuate. Thuidium.
- Family XVIII. LESKEACEAE.

ANOMODON Hook and Taylor.

- 1.—Base of leaves with large fimbriate-papillose auricles. apiculatus.
 Base of leaves not auriculate. 2.
- 2.—Leaves filiform-acuminate. rostratus
 Leaves obtuse or apiculate. 3.
- 3.—Branches attenuate. attenuatus.
 Branches not attenuate. 4.
- 4.—Leaves open-erect, teeth nodose. obtusifolius.
 Leaves secund, teeth not nodose. viticulosus.

- A. apiculatus** Br. & Sch. Base of trees, in moist woods; frequent.
- A. attenuatus** (Schreb.) Hüben. On rocks and base of trees; common, but rarely fruiting.
- A. minor** (P. Beauv.) Fuern. *A. obtusifolius* (Br. & Sch.) On trunks of trees. Johnson and Manchester, *G.*; Willoughby Cliffs and Charlotte, *P.*; Willoughby Mt. and Ferrisburgh, *F.*
- A. rostratus** (Hedw.) Schimp. On the ground and stones and around the roots of trees in wet places; common.
- A. viticulosus** (L.) Hook & Tayl. Limestone cave east of High Bridge, Burlington, *G.*; Brattleboro, *Fr.*

HETEROCLADIUM Br. & Sch.

- H. squarrosulum** (Voit) Lindb. (*H. dimorphum*, Brid.) Dry shaded rocks. Brattleboro, *Fr.*

LESKEA Hedw.

- 1.—Costa percurrent. *nervosa*.
Costa not percurrent. 2.
- 2.—Leaves bluntish; segments cleft between the articulations. *obscura*.
Leaves acute, segments not cleft. *polycarpa*.
- L. nervosa** (Schwaegr.) Myrin. Trunks of trees. Smugglers Notch, *P.*; Mt. Hor, *F.*
- L. obscura** Hedw. Brattleboro, *Fr.*; Little Otter Creek, Ferrisburgh, Lewis Creek and Willoughby Mt., *F.*
- L. polycarpa** Ehrh. Roots and trunks of trees, Cambridge, *P.*

MYURELLA Br. & Sch.

- Leaves serrulate, obtuse or rarely short apiculate. *julacea*.
Leaves spinulose-dentate, abruptly long acuminate. *Careyana*.
- M. Careyana** Sull. Limestone cave east of High Bridge, Burlington, *G.*; Brattleboro, *Fr.*; Smuggler's Notch, Eggleston; Williamstown Gulf, Willoughby Mt., and Mt. Hor, *F.*; Limestone ledges, Dorset Mt. *G.*
- M. julacea** (Vill.) Br. & Sch. Cliffs of Mt. Sterling, *B.*; Cliffs of Mt. Mansfield, Mt. Hor, and Willoughby Mt., *F.*

THELIA Sulliv.

- Papillae of leaves simple. *hirtella*.
Papillae of leaves 2-4-furcate. *asprella*.
- T. asprella** (Schimp.) Sulliv. Roots and stumps of trees, Brattleboro, *Fr.*
- T. hirtella** (Hedw.) Sulliv. Roots and trunks of trees, Brattleboro, *Fr.*

THUIDIUM Br. & Sch.

- | | |
|---|--------------|
| 1.—Plants large (to 10 cm.), ascending, erect, 1-pinnate. | 3. |
| Plants large (to 10 cm.), creeping, 2-3-pinnate. | 2. |
| Plants small (to 5 cm), creeping, 1 pinnate. | scitum. |
| 2.—Stem leaves spreading-recurved, margins plane; perichaetium not ciliate, recognitum. | |
| Stem leaves erect-spreading, margins recurved; perichaetium ciliate. | delicatulum. |
| 3.—Leaf cells roundish or oblong 2-1:1. | abietinum. |
| Leaf cells long-rhombic to linear, 3-6:1. | 4. |
| 4.—Stem leaves soft, subclasping, decurrent. | Blandovii. |
| Stem leaves rigid, plicate-striate, subdecurrent. | paludosum. |

T. abietinum (L.) Br. & Sch. Growing in short grass, seldom or never fruiting. Abundant on dry soil near Burlington, especially near Twin Bridges, *G.*; Willoughby Mt., *F.*; Smuggler's Notch, *B.*; Fairhaven, Eggleston.

T. Blandovii (W. & M.) Br. & Sch. Wet meadow, Willoughby Lake, *F.*; Peacham, *Bl.*

T. delicatulum (L.) Mitt. On the ground, rotten wood, stones and rocks in shady places; common.

T. paludosum (Sulliv.) Rau & Hervey. Swamps. Brattleboro, *Fr.* (Det. Sullivant.)

T. recognitum (Hedw.) Lindb. In habit similar to *T. delicatulum* with which it is often confused. Distinguished by its spreading, recurved leaves with their long-celled thickened acumen. Frequent.

T. scitum (Beauv.) Aust. Brattleboro, *Fr.*; Fairhaven, Eggleston.

T. scitum aestivale Austin. Base of trees, Johnson, *G.*; Monkton, *P.*; Peacham, *Bl.* Vide Bull. Torr. Club 23:83. 1886.

Family XIX. HYPNACEAE.

AMBLYSTEGIUM Br. and Sch.

- | | |
|--|---------------|
| 1.—Leaves with a distinct border of narrow incrassate cells. | Lescurii. |
| Leaves not bordered. | 2. |
| 2.—Leaves ecostate or with obscure traces of a costa, | 3- |
| Leaves costate. | 6. |
| 3.—Leaves open-erect to appressed-imbricate. | 4. |
| Leaves spreading, squarrose. | 5. |
| 4.—Plants minute, filiform (1-2 cm.) | confervoides. |
| Plants larger, in wide flat tufts. | adnatum. |
| 5.—Alar cells abruptly enlarged, often inflated and colored. | stellatum. |
| Alar cells scarcely different or quadrate or rectangular. | hispidulum. |

- | | |
|---|----------------|
| 6.—Costa extending to apex. | 7. |
| Costa ending below apex. | 9. |
| 7.—Leaves acuminate. | 8. |
| Leaves not acuminate, ovate to oblong-lanceolate. | fluviatile. |
| 8.—Basal cells abruptly enlarged. | irriguum. |
| Basal cells not enlarged. | varium. |
| 9.—Leaves reflexed-squarroulose. | chrysophyllum. |
| Leaves open-erect. | 10. |
| 10.—Cells near middle of leaf 10-15:1. | riparium. |
| Cells near middle of leaf less than 8:1. | serpens. |
- A. adnatum** (Hedw.) Jaeger & Sauerb. On rocks and base of trees in shady places. Springfield, Johnson, *G.*; Hinesburgh, *P.*; Peacham, *Bl.*; Brattleboro, *Fr.*
- A. chrysophyllum** (Brid.) De Not. On stones and base of trees in moist places. Monkton, *P.*; Brattleboro, *Fr.*; Burlington and Manchester, *G.*; Waverly Cascades, *B.*
- A. confervoides** (Brid.) Br. & Sch. Swamps, Charlotte, *P.*; Rattling Brook, Willoughby, *F.*
- A. fluviatile** (Swtz.) Br. & Sch. On rocks in cold brooks. Mt. Mansfield and Charlotte, *P.*
- A. hispidulum** (Brid.) Grout. On dead limbs of trees. Brattleboro, *Fr.*; Roaring Brook, Willoughby Lake, *F.*; Underhill Notch, *G.*; Monkton and Charlotte, *P.*
- A. irriguum** (Hook. & Wils.) Br. & Sch. Rocks in bed of brooks. Peacham, *Bl.*; Williamstown Gulf, *F.*; Brattleboro, *Fr.* In Gray Herbarium as *A. varium* var.
- A. Lescurii** (Sulliv.) Aust. Brattleboro, *Fr.* In the Gray Herbarium. *Vide* Sullivant in *Icones Muscorum*.
- A. riparium** (L.) Br. & Sch. On stones, roots of trees and rotting wood, in swamps and also growing in water. Charlotte and Monkton, *P.*; Barnet, *Bl.*; Ferrisburgh, *F.*
- A. serpens** (L.) Br. & Sch. On decayed stumps and muddy shores Johnson and Newfane, *G.*; Brattleboro, *Fr.*; Mt. Hor, *F.*
- A. stellatum** (Schreb.) Lindb. Willoughby Cliffs, *F.*
- A. varium** (Hedw.) Lindb. (*A. orthocladon* L. & J., non Beauv.) Owl's Head Mt. and Eagle Cliff, Lake Memphremagog, *F.*; Brattleboro, *Fr.*

HYLOCOMIUM Br. & Sch.

- | | |
|--|--------------|
| 1.—Paraphyllia lacking. | triquetrum. |
| Paraphyllia present. | 2. |
| 2.—Leaves bicostate. | 3. |
| Leaves unicostate to middle. | Pyrenaicum. |
| 3.—Plants regularly 2-3 pinnate, | proliferum. |
| Plants irregularly or pinnately branching. | 4. |
| 4.—Stem leaves loosely erect. | umbratum. |
| Stem leaves squarrose-spreading. | brevirostre. |
- H. brevirostre** (Ehrh.) Br. & Sch. Shore of Lake Memphremagog near Mountain House, Owl's Head Mt., Canada, *F.*; only a few miles north of the Vermont line and undoubtedly occurs within the State. Reported by Frost but no specimen has been seen.
- H. Pyrenaicum** (Spruce) Lindb. (*H. Oakesii* Sulliv.) Stowe, *P.*; Mt. Hor and Willoughby Mt., *F.*
- H. proliferum** (L.) Lindb. (*H. splendens* Hedw.) On decaying logs, stumps, earth and stones in cool moist woods, especially in mountain regions.
- H. triquetrum** (L.) Br. & Sch. On soil and decaying wood in damp shady places; common.
- H. umbratum** (Ehrh.) Br. & Sch. Abundant on earth and rocks, in mountain woods; seldom fruiting. Mt. Mansfield, *P.*; Stratton Mt., *G.*; Brattleboro, *Fr.*; Mt. Hor, *F.*

HYPNUM Dill.

- | | |
|--|--------------|
| 1.—Leaves spreading or complanate, not secund. | 2. |
| Leaves secund. | 12. |
| 2.—Costa extending to middle of leaf or beyond. | 3. |
| Costa very short and double or none. | 6. |
| 3.—Leaves acute or acuminate. | palustre. |
| Leaves obtuse, entire. " | 4. |
| 4.—Costa subpercurrent. | cordifolium. |
| Costa reaching middle of leaf. | 5. |
| 5.—Branches irregularly pinnate; leaves spreading. | Richardsoni. |
| Branches few, leaves imbricate. | stramineum. |
| 6.—Alar cells abruptly enlarged (often inflated or colored.) | 7. |
| Alar cells scarcely different or quadrate or rectangular, not abruptly enlarged. | 10. |
| 7.—Operculum short-rostrate. | Haldanianum. |
| Operculum convex or conic. | 8. |

8.—Leaves falcate.	sugyrium.
Leaves not falcate.	9.
9.—Leaves acute or short apiculate, alar cells few, large.	palustre.
Leaves obtuse, alar cells hyaline.	cuspidatum.
10.—Plants terrestrial, bright yellow-green.	Schreberi.
Plants subaquatic, dark or dirty green.	11.
11.—Plants very large 10-25 cm. long, dioicous; leaves oblong-ovate.	scorpioides.
Plants smaller 5-10 cm.; monoicous; leaves ovate.	molle.
12.—Costa single, reaching the middle or beyond.	13.
Costa short and double or none.	24.
13.—Leaves transversely rugose.	14.
Leaves not rugose.	15.
14.—Plants slender.	aduncum gracilescens.
Plants very stout.	rugosum.
15.—Paraphyllia abundant.	16.
Paraphyllia none.	17.
16.—Leaves plicate.	commutatum.
Leaves not plicate.	filicinum.
17.—Annulus none.	18.
Annulus present, often large.	19.
18.—Leaves quite entire, short acuminate.	palustre.
Leaves denticulate, subulate acuminate.	fluitans.
19.—Leaves acute or bluntish.	ochraceum.
Leaves gradually long acuminate.	20.
20.—Leaves broad (1-1.5 mm.), crumpled and plicate when dry.	Wilsoni.
Leaves narrower (0.5-1 mm.), not crumpled when dry.	21.
21.—Leaves denticulate.	uncinatum.
Leaves entire.	22.
22.—Leaves auricled.	aduncum.
Leaves not auricled.	23.
23.—Leaves plicate; plants pale green or shining yellow.	vernicosum.
Leaves smooth; plants brown, purple, or blackish.	revolvens.
24.—Plants regularly pinnate.	25.
Plants irregularly branched.	29.
25.—Capsule costate and arcuate when dry.	curvifolium.
Capsule not costate.	26.
26.—Leaves serrate or denticulate all around.	27.
Leaves serrate or denticulate only above the middle.	28.

- 27.—Capsule long-cylindric, sub-erect or slightly incurved. *imponens.*
Capsule ovate, oblong or obovate, inclined or arcuate. *molluscum.*
- 28.—Stem leaves plicate; plants large (to 15 cm.). *Crista-castrensis.*
Plants small (to 5 cm.); stem leaves not plicate. *fertile.*
- 29.—Leaves entire. *pratense.*
Leaves serrulate or denticulate above. *30.*
- 30.—Costa double, reaching middle of leaf. *reptile.*
Costa double, short. *cupressiforme.*
- H. aduncum** Hedw. Swampy ground brooks. Shelburne and Charlotte, P.; Brattleboro, Fr.; Willoughby Lake, F.
- H. aduncum gracilescens** Br. & Sch. Wet meadow near Willoughby Lake, F.
- H. commutatum** Hedw. Base of southern part of Willoughby Cliff, F.
- H. cordifolium** Hedw. New Haven, F.; Monkton, Richford and Starksboro, P.; Sutton and Willoughby Lake, F.; Brattleboro, Fr.
- H. crista-castrensis** L. On soil and decaying logs, in cool, moist woods; common in mountainous regions.
- H. cupressiforme** L. Brattleboro, Fr.
- H. curvifolium** Hedw. Decaying log near Lye Brook, Manchester, G.; Brattleboro, Fr. Distinguished from *H. imponens* by its stouter cernuous costate capsule. The Manchester specimens are rather more slender than is usual with this species.
- H. cuspidatum** L. Marshy places. Brattleboro. Fr.
- H. eugyrium** Br. & Sch. Rocks near streams, Brattleboro, Fr.; mill stream below Mountain House, Jay Peak, F.; Smuggler's Notch, Dr. Kennedy.
- H. fertile** Sendt. Although often reported I have not yet seen any true *H. fertile* from Vermont.
- H. filicinum** L. Wet places. Williamstown Gulf, F.; Brattleboro, Fr.; Porter's Swamp, Colchester. G.
- H. fluitans** L. Bogs, summit of Mt. Mansfield, F., G.
- H. Haldanianum** Grev. Common everywhere; in moist woods on decaying logs; easily recognized by its large cylindric capsules and inflated alar cells.
- H. imponens** Hedw. Decaying logs, stumps, etc., in moist woods. Monkton, P.; Peacham, Bl.; Brattleboro, Manchester, G.; Burlington, Fr. Easily distinguished by its regularly pinnate branching, falcatesecund leaves and cylindric, nearly erect capsule.

- H. molle** Dicks. Wet rocks. Mt. Mansfield, *G.*
- H. molluscum** Hedw. Moist places; Brattleboro. *Fr.*
- H. ochraceum** Turn. Brattleboro, *Fr.* In Gray Herbarium. Smuggler's Notch, Dr. Kennedy.
- H. palustre** Hedw. Limestone rocks, bed of brook, Brattleboro, *Fr.*; Peacham, *Bl.* *Vide* Lesq. & James, Mosses of North America, 399.
- H. pratense** Koch. On the ground in wet places. Milton Falls, and banks of the Lamoille River, Johnson, *G.*; Brattleboro, *Fr.*
- H. reptile** Mx. On decaying logs and stumps, in moist woods; not rare and distributed throughout the State.
- H. reptile protuberans.** Plants smaller and more slender; capsule shorter. In alpine and subalpine regions. Mt. Mansfield, *P.*
- H. revolvens** Swtz. Mt. Hor, *F.*
- H. Richardsoni** (Mitt.) L. & J. Shallow water in woods. Barnet, *Bl.*
- H. rugosum** L. Bluffs of Lake Champlain near Howard Park, Burlington, *G.*
- H. scorpioides** L. Cedar swamps, Willoughby region, Newark, and Sutton, *F.*
- H. stramineum** Dicks. Bogs, Johnson, *G.*
- H. Schreberi** Willd. On the ground in moist shady places. A very common and beautiful species.
- H. uncinatum** Hedw. On damp soil in moist mountain woods. Mt. Elmore and Mt. Mansfield, *G.*; Mt. Mansfield, *F.*; Brattleboro, *Fr.*; Willoughby, Mt. Hor, and Mt. Mansfield, *F.*
- H. vernicosum** Lindb. Swamps, Starksboro, *P.* "Seen by Lindberg himself." Borders of Porter's Swamp, Colchester, *G.*; ("Ad var. majus, Lindb. accedens") Det. F. Renauld.
- H. Wilsoni** Sch. var. **hamatum** (Br. & Sch.) Ren. (*H. aduncum* var. *hamatum* Br. & Sch.) Bog near Willoughby Lake, *F.*; Shelburne, *P.*; Det. F. Renauld. (In herb *F.* and *G.*)

PLAGIOTHECIUM Br. & Sch.

- | | |
|-------------------------------------|--------------|
| 1.—Leaves complanate. | 2. |
| Leaves equally spreading, straight. | striatellum. |
| 2.—Operculum rostrate. | 3. |
| Operculum convex or conic. | 4. |
| 3.—Leaves entire. | sylvaticum. |
| Leaves serrulate all around. | deplanatum. |

- | | |
|---|---------------|
| 4.—Leaves entire. | 3- |
| Leaves sharply serrate to the middle. | turfaceum. |
| 5.—Capsule obovate, campanulate when dry. | Muellerianum. |
| Capsule oblong, constricted under the mouth when dry. | denticulatum. |

P. denticulatum (L.) Br. & Sch. On the ground and moist rocks in mountain regions. Mt. Mansfield, *P.*, *G.*, and *F.*; Monkton, *P.*; Johnson, *G.*; Brattleboro, *Fr.*; Westmore and Mt. Hor, *F.*

P. deplanatum (Sch.) Grout. (*Hypnum deplanatum* Sch.) Limestone cave east of High Bridge, Burlington, *G.*

This is one of the three new binomials in the list and is inserted because of the difficulty of making an intelligible key if retained in the position given it in the Manual.

P. Muellerianum Sch. On soil, Mt. Mansfield, *P.*

The specimen which is referred to this species is incomplete and the determination somewhat uncertain. In herb. C. G. Pringle.

P. striatellum (Brid.) Lindb. (*P. Muhlenbeckii* Br. & Sch.) Willoughby Mt., Mr. Hor, and Jay Peak, *F.*; Mt. Mansfield, *G.*

P. sylvaticum (Huds.) Br. & Sch. On earth and stones in moist and shady places. Mt. Mansfield and Charlotte, *P.*; Peacham, *Bl.*; Mt. Mansfield, and Stratton, *G.*

P. turfaceum Lindb. Oh decaying wood on borders of Porter's swamp, Colchester; submerged at high water, *G.*; on soil, Peacham, *Bl.*; Underhill Notch, *G.*

RAPHIDOSTEGIUM (Br. & Sch.) De Not.

R. recurvans (Mx.) Jaeger & Sauerb. On trees and rotting logs. Monkton, Underhill, and Smuggler's Notch, *P.*; Stowe, *B.*; Peacham, *Bl.*; Brattleboro, *Fr.*

Family XX. BRACHYTHECIACEAE.

BRACHEYTHECIUM Br. & Sch.

- | | |
|---|-----------|
| 1.—Costa extending into apex. | 2. |
| Costa extending $\frac{1}{2}$ — $\frac{2}{3}$ length of leaf. | 4. |
| 2.—Seta rough throughout; plants slender. | 3- |
| Seta nearly smooth at base; plants more robust. | populeum. |
| 3.—Plants very slender; leaf cell 3-5:1. | reflexum. |
| Plants more robust; leaf cells 8-10:1. | glaciale. |
| 4.—Branch leaves entire. | 5- |
| Branch leaves serrate. | 6. |

- | | |
|--|------------------------|
| 5.—Seta rough above. | <i>plumosum</i> |
| Seta smooth throughout. | <i>acutum</i> . |
| 6.—Seta smooth. | 7. |
| Seta more or less roughened. | 10. |
| 7.—Capsules 3-4:1, suberect. | <i>oxycladon</i> . |
| Capsules 2-3:1, strongly inclined to horizontal. | 8. |
| 8.—Stem leaves gradually narrowed from base to slender apex. | 9. |
| Stem leaves acuminate. | <i>salebrosum</i> . |
| 9.—Stem leaves lanceolate, 0.6 mm. broad. | <i>flexicaule</i> . |
| Stem leaves triangular-ovate, 1 mm. broad. | <i>acutum</i> . |
| 10.—Seta rough above, nearly smooth below. | 11. |
| Seta rough throughout. | 12. |
| 11.—Leaves plicate, long acuminate. | <i>campestre</i> . |
| Leaves not plicate, shorter acuminate. | <i>plumosum</i> . |
| 12.—Cells of branch leaves 5:1, papillose by the thickened angles of the cell walls. | <i>Novae-Angliae</i> . |
| Cells of branch leaves at least 8-1, smooth. | 13. |
| 13.—Secondary stems dendroid; leaves ovate and very short acuminate. | <i>rivulare</i> . |
| Secondary stems not dendroid; leaves slender pointed. | 14. |
| 14.—Stem leaves lanceolate. | <i>velutinum</i> . |
| Stem leaves ovate to triangular-ovate. | 15. |
| 15.—Cilia not appendiculate; plants yellow-green. | <i>rutabulum</i> . |
| Cilia appendiculate; plants green, usually complanate-foliate. | <i>Starkel</i> . |
- B. *acutum*** (Mitt.) Sull. In swampy places and on moist earth. Monkton and Charlotte, *P.*
- B. *campestre*** Br. & Sch. On damp earth and stones in woods, Johnson, also southern Vermont, *G.*; Burlington. W. Danville, *Bl.* (In Herb. Univ. of Wisconsin.)
- B. *flexicaule*** Ren. & Card. On rocks in woods, Manchester, *G.* Det. Cardot.
- B. *glaciale*** Br. & Sch. Willoughby Mt., *F.*
This is the fourth station in North America for this plant.
- B. *Novae-Angliae*** (Sull. & Lesq.) Jaeger and Sauerb. On the ground and stones, in moist and shady places, especially in mountainous regions. Stowe, *B.*; Johnson, *G.*; Brattleboro, *Fr.*; Underhill, *P.*
- B. *oxycladon*** (Brid.) Jaeger & Sauerb. (*B. laetum*. Br. & Sch.) On the ground, roots of trees, and rocks in woods.
Stowe, *B.*; Burlington, Underhill Notch, and Newfane, *G.*
- B. *oxycladon dentatum*** (L. & J.) Grout. Swamp, Monkton, *P.*

- B. plumosum** (Sw.) Br. & Sch. On stones in brooks and moist rocks in woods. Camel's Hump, Mt. Mansfield, and Monkton, *P.*; Stratton and Newfane, *G.*; W. Barnet, *Bl.*; Brattleboro, *Fr.*
- B. populeum** (Hedw.) Br. & Sch. Waverley Cascades, *B.*; Manchester and Newfane, *G.*
- B. populeum ovatum** Grout. On rocks in woods with *Grimmia apocarpa*, Johnson, *G.*; Peacham, *Bl.*
- B. reflexum** (Starke) Br. & Sch. In mountainous regions, on decaying logs, roots of trees and less frequently on the soil. Stratton and Newfane, *G.*; Southwest Vermont and Mt. Mansfield, *P.*; Willoughby, *F.*
- B. rivulare** Br. & Sch. Subaquatic, in swamps and wet places. Peacham and Ryegate, *Bl.*; Underhill, *P.*; Brattleboro, *Fr.*; Mt. Hor, *F.*
- B. rutabulum** (L.) Br. & Sch. On the ground and stones in wet places. Stowe, *B.*; Monkton, *P.*
- B. salebrosum** (Hoffm.) Br. & Sch. On earth and stones, roots and trunks of trees in woods. Stowe, *B.*; Charlotte, *P.*; W. Barnet, *Bl.*; Mt. Mansfield, *G.*; Brattleboro, *Fr.*
- B. Starkei** (Brid.) Br. & Sch. On decaying logs and stumps in woods, especially in mountainous regions. Mt. Mansfield, Stratton and Johnson, *G.*; Peacham, *Bl.*
- B. velutinum** (L.) Br. & Sch. On soil, in moist, shady places. Stowe, *B.*; Newfane, *G.*; Brattleboro, *Fr.* It is stated on the label in Frost's collection that this species was discovered in America for first time by C. C. Frost at Brattleboro.

CAMPTOTHECIUM Br. & Sch.

- C. nitens** (Schreb.) Schimp. Moist meadows, Willoughby Lake, *F.*

EURHYNCHIUM Br. & Sch.

- | | |
|---|-------------------|
| 1.—Seta rough. | 2. |
| Seta smooth. | strigosum. |
| 2.—Branch leaves cucullate at apex, abruptly long filiform acuminate. | piliferum. |
| Branch leaves acute to almost obtuse. | hians. |
- E. piliferum** (Schreb.) Br. & Sch. On the ground and base of trees in woods and shady meadows. "Vermont" *Fr.*; Burlington, Carey. In the Gray Herbarium.
- E. strigosum** (Hoffm.) Br. & Sch. On soil in moist and shady places. Monkton, *P.*; Willoughby, *F.*; Brattleboro, *Fr.*; Dorset Mt., *G.*

- E. hians** (Hedw.) Jaeger & Sauerb. Rock Point, Burlington, G.; "Cold Brook," Willoughby, F.

HOMALOTHECIUM Br. & Sch.

- H. subcapillatum** (Hedw.) Sulliv. On trees. Brattleboro, Fr.

MYUROCLADA Bescherelle.

- M. Boscii** (Schwaegr.) Besch. (*Hypnum Boscii*. Schwaegr.) On soil in woods and meadows. Seldom fruiting. Brattleboro, Fr.

POROTRICHUM Brid.

(*Thamnum* Br. & Sch.)

- P. Alleghaniense** (C. Muell.) Rocky margins of rivulets, Brattleboro, Fr. The specimen in Frost's herbarium, though not examined microscopically appears to be this species. Woodstock, Miss Soule. In Herb. Faxon.

Porotrichum evidently does not belong in this family but is left here because of the uncertainty as to its true position.

RHYNCHOSTEGIUM Br. & Sch.

Leaves apparently two ranked; plants of dry woods.

serrulatum.

Leaves spreading every way; growing on stones in brooks.

rusciforme.

- R. rusciforme** (Neck.) Br. & Sch. On stones in brooks. Underhill and Bakersfield, P.; Newfane, G.
- R. serrulatum** (Hedw.) Jaeger & Sauerb. On the ground in dry woods. Brattleboro, Fr.

Family XXI. **ISOTHECIACEAE** Spruce.

CLIMACIUM Web. & Mohr.

1.—Capsules 3-4:1; median leaf cells 10:1.

dendroides.

Capsules 5-6:1; median leaf cells 2-7:1.

Americanum.

- C. Americanum** Brid. Swamps, wet soil, and rocks, sometimes growing on cliffs; common but rarely fruiting.
- C. Americanum Kindbergii** Ren. & Card. In swampy places. Stowe, B.
- C. dendroides** (L.) Web. and Mohr. Common in swamps in northern Vermont. Milton and Johnson, G.; Castleton, Eggleston.

ENTODON C. Muell.

(Cylindrothecium Br. & Sch.)

- 1.—Teeth of peristome conspicuously hyaline margined. **repens.**
 Teeth not hyaline margined. 2.
- 2.—Very broadly complanate foliate; annulus of large cells. **cladorrhizans.**
 Nearly terete foliate, annulus of narrow cells. **seductrix.**
- E. cladorrhizans** (Hedw.) C. Muell. On decaying wood and base of trees in moist shady places; frequent.
- E. repens** (Brid.) Grout. (*Platygyrium repens*, Br. & Sch.) Rotting logs in moist woods. Rock Point, Burlington, G.; Mt. Hor cliffs, F.
- E. seductrix** (Hedw.) C. Muell. On decaying wood and moist soil. Brattleboro, Fr.

PYLAISIELLA Kindb.

(Pylaisia Br. & Sch.)

- Segments of endostome partially adherent to teeth, free at the apex; spores 0.018—0.024 mm. **intricata.**
- Segments wholly adherent; spores 0.026—0.030 mm. **velutina.**
- P. intricata** (Hedw.) Grout. On bark of living trees; common.
- P. velutina** (Schimp.) Kindb. Killington Peak, Mrs. Laura Morgan. (In Herb. Frost as *P. polyantha*.)

Family XXII. FABRONIACEAE.

ANACAMPTODON Brid.

- A. splachnoides** (Froelich.) Brid. On an old yellow birch, Smuggler's Notch, Dr. Kennedy. In Herb. U. V. M. This moss has a peculiar habit of growing around old knot holes and similar cavities in wood.

Family XXIII. NECKERACEAE.

HOMALIA Brid.

- H. Jamesii** Schimp. Base of Mt. Hor cliffs, F.

LEPTODON Mohr.

- L. trichomitrium** (Hedw.) Mohr. Trees in woods, Brattleboro, Fr.
 I regard Frost's specimens as doubtfully this species.

NECKERA Hedw.

Branches attenuate, often flagelliform.

oligocarpa.

Branches obtuse, never flagelliform.

pennata.

N. oligocarpa Bruch. On trees. Willoughby, Dr. Kennedy. In herb.
A. J. G. & Dr. K.

N. pennata (L.) Hedw. On trunks of trees; common in mountainous regions.

Family XXIV. CRYPHAEACEAE.

LEUCODON Schwagr.

Leaves entire, slender pointed; median cells linear-vermicular.

sciurioides.

Leaves serrulate and broader at apex; median cells broader and shorter.

brachypus.

L. brachypus Brid. Trunks of beech trees, in mountains. Manchester, G.; Underhill, P.; Willoughby region, Mt. Hor and Ferrisburgh, F.

L. sciurioides (L.) Schwagr. On trees. Willoughby, Dr. Kennedy; Mt. Hor. F.

Family XXV. FONTINALACEAE.

FONTINALIS Dill. L.

1.—Leaf cells rhombic-hexagonal, 6:1 or less.

2.

Leaf cells long linear, 7-30:1.

4.

2.—Plants very robust; branches markedly triangular-prismatic.

antipyretica gigantea.

Plants much more slender and scarcely triangular-prismatic.

3.

3.—Female flowers abundant, in most leaf axils.

Novae-Angliae.

Female flowers rare, at base of stems.

biformis.

4.—Leaves concave and incurved on the borders.

Dalecarlica.

Leaves plane or concave, not incurved.

5.

5.—Alar cells very large.

Sullivantii.

Alar cells moderately or not at all enlarged.

Lescurii.

Fontinalis antipyretica L. var. *gigantea* Sulliv. Cold brooks. Brattleboro, Fr.; Johnson, G.; Peacham, Bl.

F. biformis Sulliv. Found in New Hampshire and Massachusetts by Faxon, and reported from Vermont by Frost.

F. Dalecarlica Br. & Sch. Mountain brooks. Underhill, P.; Brattleboro, Fr. ; Newfane, G.

F. Lescurii Sulliv. Enosburgh, P.; Elmore Pond, G.; Willoughby Lake region, P.

- F. *Novae-Angliae*** Sulliv. Little Otter Creek, Ferrisburgh, *F.*
F. *Sullivantii* Lindb. Brattleboro, *Fr.* *Vide* Lesq. & James, Mosses of North America, 271.

The following list of mosses has been reported from Vermont by Frost but no specimens of these species have been found either in his herbarium at Brattleboro or in the Gray (Sullivant) Herbarium, which Dr. Robinson has very kindly searched for me:

Bruchia flexuosa Muell.
Fissidens minutulus Sulliv.
Leptotrichum vaginans Lesq. & James.
Grimmia Pennsylvanica Schwaegr.
Atrichum crispum James.
Dichelyma capillacea Br. & Sch.
Pterigynandrum filiforme Hedw.
Hypnum (Thuidium) gracile Br. & Sch.
Hypnum (Thuidium) minutulum Hedw.
Hypnum demissum, Wils.
Hypnum (Plagiothecium) Sullivantiae Schimp.

Many of these undoubtedly occur in the State and will be found again sooner or later.

Bryum pseudotriquetrum was also reported by Frost and in the Gray Herbarium is a specimen labelled "*Bryum pseudotriquetrum?* Brattleboro, Frost." On examination of this specimen it seemed very doubtfully this species and consequently it is not included in the list.

APPENDIX.

The author greatly regrets that he did not sooner know of the great amount of work done on Vermont mosses by Dr. George G. Kennedy of Readville, Mass. It has been possible to introduce into the text most of his additions but a large number of localities which should have been credited to him came too late to be inserted.

* * * * *

Mrs. Britton informs us that Dr. Frost's *Physcomitrium pyriforme* is in all probability *P. turbinatum* (Mx.) Brid.

* * * * *

POLYTRICHUM L.

(Change 4 of key to 5 and insert the following as 4.)

- 4 —Terminal cell of the lamellae flat topped or notched in section broader than high. 5.

Terminal cell of lamellae rounded, higher than broad.

gracile.

P. *gracile* Dicks. Swamp, Willoughby region, Dr. Kennedy. In herb. Dr. K. and G.

INDEX.

- Amblystegium*, 22, 23, 25.
Amphoridium, 15.
Anacamptodon, 22, 35.
Andrea, 4, 9.
Anisothecium, 6, 11.
Aoetangium, 5, 15.
Anomodon, 23.
Atrichum, 9, 37.
Aulacomnium, 20, 21.
Barbula, 5, 6, 14, 15.
Bartramia, 7, 19.
Blindia, 6, 11.
Brachythecium, 23, 31.
Bruchia, 37.
Bryum, 7, 18, 37.
Buxbaumia, 5, 9.
Campthothecium, 22, 33.
Catharina, 7, 9.
Ceratodon, 6, 11.
Climacium, 22, 34.
Cylindrothecium, 35.
Cynodontium, 13.
Dichelyma, 37.
Dichodontium, 6, 11.
Dicranella, 6, 11.
Dicranum, 6, 12.
Didymodon, 14, 15.
Diphygium, 15.
Distichum, 13.
Ditrichum, 6, 13.
Drummondia, 6, 16.
Encalypta, 14.
Entodon, 22, 35.
Eurhynchium, 22, 33.
Fissidens, 6, 10, 22, 37.
Fontinalis, 7, 22, 36.
Funaria, 7, 18.
Georgia, 5, 9.
Grimmia, 5, 6, 16, 37.
Gymnocybe, 7, 20.
Gymnostomum, 14, 15.
Hedwigia, 5, 16.
Heterocladium, 24.
Homalia, 22, 35.
Homalothecium, 22, 34.
Hylocomium, 23, 27.
Hypnum, 23, 27, 34, 37.
Leersia, 5, 7, 14.
Leptobryum, 7, 19.
Leptodon, 22, 35.
Leptotrichum, 13, 37.
Leskea, 23, 24.
Leucobryum, 6, 11.
Leucodon, 22, 36.
Meesea, 7, 20.
Mnium, 7, 20.
Mollia, 5, 6, 14.
Myurella, 23, 24.
Myuroclada, 23, 34.
Neckera, 22, 36.
Oncophorus, 6, 13.
Orthopyxis, 7, 21.
Orthotrichum, 5, 7, 17.
Philonotis, 7, 20.
Physcomitrium, 5, 18.
Plagiothecium, 23, 30, 37.
Pterigynandrum, 37.
Pogonatum, 7, 9.
Pohlia, 7, 19.
Polytrichum, 7, 10.
Porotrichum, 22, 34.
Pottia, 5, 15.
Pylaisia, 35.
Pylaisiella, 22, 35.
Racomitrium, 16.
Raphidostegium, 23, 31.
Rhynchostegium, 23, 34.
Saelania, 6, 13.
Schistostega, 5, 17.
Seligeria, 6, 13.
Sphagnum, 4, 7.
Swartzia, 6, 13.
Tayloria, 5, 17.
Tetraphis, 9.
Tetraplodon, 6, 18.
Thamnium, 34.
Thelia, 23, 24.
Thuidium, 23, 25, 37.
Tortula, 5, 15.
Trematodon, 6, 13.
Ulota, 17.
Webera, 5, 15.
Weissia, 5, 7, 15, 17, 19.

Recd
1908

Contributions to the Botany of Vermont, II.

(Through the printer's error, the paging of this reprint differs from that of the original publication. All citations should correspond to the original paging, viz : Rep. Vt. Exp. Sta. II, 1897-98. Page 4 of this reprint equals page 202 of the original, etc.)

Gitt

A PARTIAL LIST OF THE PARASITIC FUNGI OF VERMONT

BY W. A. ORTON, M. S.

From the Eleventh Annual Report of the Vermont
Agricultural Experiment Station, 1897-98.

REPRINTED BY THE BOTANICAL DEPARTMENT OF THE UNIVERSITY OF VERMONT.

SEPTEMBER, 1898.



A PARTIAL LIST OF THE
PARASITIC FUNGI OF VERMONT

BY W. A. ORTON, M. S.

From the Eleventh Annual Report of the Vermont
Agricultural Experiment Station, 1897-98

REPRINTED BY THE BOTANICAL DEPARTMENT OF THE UNIVERSITY OF VERMONT

SEPTEMBER, 1898

A botanical survey of Vermont has been undertaken by the members of the Vermont Botanical Club. The greater emphasis in the work is naturally and rightly placed upon the study of the occurrence and distribution of the higher plants, looking as an immediate result toward the publication of a revised list of these plants as they occur in Vermont. The more lowly groups deserve recognition, however, and there is evidence that they are to receive it. The list of Vermont Mosses recently prepared by Dr. Grout is the first of what it is hoped will be a series of contributions to our knowledge of the cryptogamic plants of the state. The present publication forms a second contribution. A third list, including the liverworts, is nearly ready. The list of Vermont Mosses is included in the Eighteenth Report of the Vermont Board of Agriculture (1898), and this list of Fungi forms a part of the Report of the Botanists in the Eleventh Report of the Vermont Experiment Station (1897-98). In order to make these lists more readily accessible to botanists outside of our state the Botanical Department of the University of Vermont has reprinted a limited number of each as separates. These will be supplied at the prices given below, which are about the cost of publication and mailing. Address, Botanical Department, University of Vermont, Burlington.

L. R. JONES.

MOSES OF VERMONT, with Analytical Keys to the Genera and Species, by
A. J. Grout, Ph. D. 38 pages. 15 cents.

A PARTIAL LIST OF THE PARASITIC FUNGI OF VERMONT, by W. A.
Orton, M. S. 24 pages. 10 cents.

A LIST OF THE VERMONT HEPATICÆ, by Clifton D. Howe, A. B.
(In preparation.)

A PARTIAL LIST OF THE PARASITIC FUNGI OF VERMONT.

BY W. A. ORTON, M. S.

INTRODUCTION.

Although the higher plants of Vermont have received much attention from various botanists, the cryptogams and especially those species of fungi parasitic upon other organisms have been much less studied. But few persons have collected these fungi within the limits of the state, and of these few no one has left definite record of his work. The first Vermont botanist of whose labors in this field we have knowledge, was Charles C. Frost, of Brattleboro. Although his energies were directed chiefly toward the fleshy fungi, he included in the "Catalogue of Plants Growing Without Cultivation within Thirty Miles of Amherst College," (1875) a list of parasitic fungi, of which 115 species come within the groups here considered. No definite localities are given in Frost's list, and no specimens were left in his herbarium. While it is probable that many, or, indeed, most of the species he mentions were collected in Vermont, we cannot be sure of it, and no species are included in the following list on the strength of Frost's publication.

No other collections of moment were made of Vermont fungi until the beginning of those on which this catalogue is based. This list has been compiled as a part of the work on plantpathology of the botanical department of the Vermont Experiment Station, and for this reason non-parasitic groups have so far received little attention. A thorough knowledge of all parasitic fungi existing in the area under consideration is essential to any detailed study of plant diseases, since a large proportion of such diseases result from the invasion of the plant by parasitic fungi, while a considerable number of those which originate in other ways are complicated by the attacks of such parasites.

It is fully recognized that there is no sharp line of distinction between parasitic fungi and those which are saprophytes, and there is no attempt, therefore, to make close discriminations in this matter.

The present list includes the downy mildews, powdery mildews, smuts and rusts. The nomenclature follows, with some exceptions, Saccardo's *Sylloge Fungorum*. In the Erysipheæ, Burrill's classification as given in Ellis and Everhart's *North American Pyrenomycetes* has been followed. The more important recent synonyms are printed in italics after the name of the fungus. In the Uredineæ the spore stage precedes the name of the host, I indicating the æcidium, II the uredo, and III the teleuto stage of the fungus. Notes of interest are then given and the locality and date of collection follow. The name of the collector is indicated by an initial: C. stands for

H. I. Collins; G. for A. J. Grout; H. for T. E. Hazen; J. for L. R. Jones; O. for W. A. Orton. The number following the initial refers to the numbered herbarium specimen of the fungus in question.

A list of this nature must of necessity be incomplete, and numerous additions will undoubtedly be made in the future. It is earnestly desired that any such additional information, especially as regards the occurrence of further species and host plants, be communicated to us, accompanied, so far as possible by specimens, which will be deposited in the University herbarium. The work is being continued as rapidly as possible looking to a further publication, which will include the remaining groups of parasitic fungi. Nearly every collection listed here is to be found in the herbarium of the University of Vermont. The few exceptions are inserted on good authority, and the location of the specimen on which the citation is based is indicated in each case.

The credit for the foundation of this work belongs to Professor L. R. Jones, who has accumulated a large part of the specimens, notes and observations upon which this list is based. Large collections were made by Mr. H. I. Collins, while a student at the University in 1890-92, and more recently by Dr. A. J. Grout and Mr. T. E. Hazen, while temporarily associated with the Experiment Station. Several others have made less extensive contributions which are acknowledged in the list. I am under great obligations for all such preparatory collections, as well as for the more immediate assistance rendered by these persons.

The work has been done in the botanical laboratory of the University under the personal supervision of Professor Jones, to whom I am very greatly indebted for assistance received at every point of the work.

W. A. O.

University of Vermont, Burlington, Sept., 1898.

PERONOSPOREAE.

BREMIA LACTUCAE Regel. (*Peronospora ganglioniformis*. (B.) DeBy.)

On *Lactuca sativa*, Lettuce. Occasionally destructive in green-houses. Burl., Dec. 1891; J. 411.

On *Prenanthes altissima*. Common. Burl., Aug. 1890; J. 410.

CYSTOPUS BLITI (Biv.) DeBy.

On *Amarantus retroflexus*, Pigweed. Abundant. Burl., Aug. 1890; J. 402.

CYSTOPUS CANDIDUS (Pers.) Lev.

On *Capsella Bursa-pastoris*, Shepherd's Purse. Very common. Burl., Sept. 1890; J. 751. South Hero, July, 1898; Waugh, 1757.

On *Brassica campestris*, Wild Turnip. Burl., July, 1898; H. 1816.

On *Brassica nigra*, Black mustard. Burl., Sept. 1890; J. 748.

On *Brassica sinapistrum*, Charlock. Burl., July, 1898; O. 1813.

On *Dentaria diphylla*. Abundant. Burl., June, 1891; C. 750.

On *Lepidium intermedium*, Peppergrass. Common. Burl., 1894; J. 749.

On *Raphanus sativus*, Radish. Neither common nor very injurious. Burl., Sept. 1891; J. 752.

On *Sisymbrium officinale*, Beaver, July, 1898; O. 1817.

CYSTOPUS PORTULACAE (DC.) Lev.

On leaves and stems of *Portulaca oleracea*, Purslane. Common. Burl., July, 1894; J. 754.

CYSTOPUS TRAGOPOGONIS (Pers.) Schroet. (*C. cubicus* DeBy.)

On *Ambrosia artemisiaefolia*, Ragweed. Burl., Aug. 1892; J. 756.

On *Tragopogon porrifolius*, Salsify. Burl., June, 1890; J. 404.

PERONOSPORA ALTA Fuckel.

On *Plantago major*, Plantain. Burl., June, 1891; J. 765.

On *Plantago Rugellii*. Burl., July, 1898; J. and O. 1780.

PERONOSPORA EFFUSA (Grev.) Rabh.

On *Chenopodium album*, Pigweed. Burl., June, 1893; J. 768.

PERONOSPORA PARASITICA (Pers.) DeBy.

On *Dentaria laciniata*. Common. Burl., June, 1891; J. 769.

On *Dentaria maxima*. Burl., May, 1897; J. 783.

On *Raphanus sativus*, Radish. Not common. Burl., Sept., 1894; J. 1367.

PERONOSPORA SCHLEIDENI Ung.

On *Allium Cepa*, Onion. Apparently not common, but very destructive where occurring. Milton, Sept. 1895; J. 773.

PHYTOPHTHORA INFESTANS (Mont.) DeBy.

On *Solanum tuberosum*, Potato. Common and in favorable seasons very destructive, causing the familiar late blight and rot of the potato. Burl., Sept. 1890; J. 408.

PLASMOPARA HALSTEDII (Farl.) Berl. & DeToni.

On *Bidens cernua*. Johnson, Sept. 1893; G. 430.

PLASMOPARA OBDUCENS Schroet.

On cotyledons of *Impatiens* sp. Burl., May, 1891; J. 780.

PLASMOPARA PYGMAEA (Ung.) Schroet.

On *Anemone nemorosa*. Burl., May, 1895; J. 779.

On *Anemone Virginiana*. Burl., May, 1897; O. 784.

PLASMOPARA VITICOLA (Berk. & Curt.) Berl. & DeToni.

On *Vitis æstivalis*, Summer Grape. Snake Mt., July, 1898; O. 1782.

On *Vitis Labrusca*, Northern Fox Grape. Burl., July, 1897; O. 778.

On *Vitis riparia*, Winter Grape. Burl., July, 1897; O. 1366.

Common and destructive, causing the downy mildew of grape leaves and the brown rot of the fruit; apparently worse on some varieties than on others.

SCLEROSPORA GRAMINICOLA (Sacc.) Schroet. (*Peronospora graminicola* Sacc.)

On *Setaria viridis*, Bottle-grass. Not common. Burl., July, 1898; J. and O. 1818.

CHYTRIDIEÆ.**SYNCHYTRIUM DECIPIENS Farl.**

On *Amphicarpaea monoica*. Common. Burl., June, 1897; O. 1204.

ENTOMOPHTHOREÆ.**EMPUSA GRYLLI Fresen.**

On Locusts (the insects), *Melanoplus atlanis* Riley. *Melanoplus femur-rubrum* De Geer. *Trimerotropus maritima* Harr.

Abundant and destructive in some seasons. Burl., Aug, 1892; J. 398.

ERYSIPHEÆ.**ERYSIPHE AGGREGATA (Pk.) Farl.**

On fertile catkins of *Alnus incana*, Alder. Johnson, Aug. 1893; G. 368.

ERYSIPHE CICHORACEARUM DC.

On *Ambrosia artemisiaefolia*, Ragweed. Common. Burl., Aug. 1896; G. 787.

On *Aster paniculatus*. Burl. Oct. 1897; O. 796.

On *Aster puniceus*. Newfane, Sept. 1892; G. 795.

On *Chelone glabra*, Turtlehead. Beaver, Sept. 1897; O. 790.

On *Cucumis sativus*, Cucumber. Injurious in the greenhouse. Burl., July, 1894; G. 1368.

On *Hedeoma pulegioides*, American Pennyroyal. Beaver, Sept. 1897; O. 791.

- On *Helianthus divaricatus*, Sunflower. Burl., Sept. 1897; O. 799.
 On *Helianthus laetiflorus*. Charlotte, Sept. 1897; O. 798.
 On *Helianthus tuberosus*, Jerusalem Artichoke. Newfane, Aug. 1892; G. 800. Burl., Aug. 1898; O. 1910.
 On *Solidago Canadensis*, Golden Rod. Burl., Sept. 1897; O. 794.
 Beaver, Sept. 1897; O. 793.
 On *Verbena hastata*, Blue Vervain. Beaver, Sept. 1897; O. 788.
 On *Verbena urticæfolia*, White Vervain. Burl., Sept. 1897; O. 789.
Cicinobolus Cesatii DeBy. frequently occurs parasitic on this fungus on various hosts.

ERYSIPHE COMMUNIS (Wallr.) Fr.

- On *Amphicarpæa monoica*. Burl., 1890; J. 801.
 On *Aquilegia vulgaris*, Columbine. In Herb. A. J. Grout.
 On *Clematis Virginiana*, Virgin's Bower. Beaver, Sept. 1897; O. 802.
 On *Delphinium alpinum*, Larkspur. Charlotte, Sept. 1897; O. 803.
 On *Lupinus perennis*, Lupine. Burl., Aug. 1897; O. 804.
 On *Oenothera biennis*, Evening Primrose. Burl., Oct. 1890; C. 807.
 On *Pisum sativum*, Pea. Burl., Oct. 1891; J. 805. No. Calais, Aug. 1898; O. 1900.
 On *Ranunculus acris*, Buttercup. Burl., Aug. 1890; C. 810. Newfane, Aug. 1892; G. 808.
 On *Thalictrum dioicum*, Meadow Rue. Beaver, Sept. 1897; O. 811.
 On *Viola blanda*, Violet. Beaver, Sept. 1897; O. 812.

ERYSIPHE GRAMINIS DC.

- On *Agropyron repens*, Witch-grass. Beaver, Sept. 1897; O. 815.
 Burl., May, 1898; O. 1369.
 On *Poa pratensis*, Kentucky Blue-grass. Burl., Oct. 1890; C. 814.
 On *Poa serotina*, Fowl Meadow-grass. Burl., June, 1898; O. 1785.
 On *Poa* sp. Winooski, Oct. 1890; C. 813.
 Very common. On witch-grass it is brownish gray and quite downy. Rather injurious.

MICROSPHÆRA ALNI (DC.) Wint.

- On *Alnus incana*, Alder. Burl., 1891; C. 813. Winooski, Oct. 1890; C. 814.
 On *Betula lutea*, Yellow Birch. Newfane, Sept. 1892; G. 816.
 Beaver, Sept. 1897; O. 817.
 On *Ceanothus Americanus*, New Jersey Tea. Burl., Sept. 1897; O. 818.
 On *Cornus alternifolia*, Dogwood. Newfane, Aug. 1892; G. 819.
 Beaver, Sept. 1897; O. 820.
 On *Corylus rostrata*, Hazel-nut. Burl., Aug. 1897; O. 821.

On *Lonicera glauca*, Honeysuckle. Burl., July, 1897; O. 823. Snake Mt., July, 1898; H. 1787.

On *Lonicera hirsuta*. Snake Mt., July, 1898; H. 1786.

On *Lonicera parviflora*. Charlotte, Sept. 1897; O. 824.

On *Lonicera Tartarica*. Burl., Sept. 1890; C. 825.

On *Ostrya Virginica*, Lever-wood. Newfane, Sept. 1892; G. 826.

On *Platanus occidentalis*, Sycamore. Townshend, Sept. 1892; G. 827.

On *Syringa vulgaris*, Lilac. Burl., Oct. 1892; J. 828.

On *Viburnum acerifolium*, Arrow-wood. Newfane, Oct. 1892; G. 831. Burl., Oct. 1897; O. 832.

On *Viburnum cassinoides*. Burl., Oct. 1897; O. 834. Charlotte, Sept. 1897; O. 835.

On *Viburnum pubescens*. Charlotte, Sept. 1897; O. 836.

MICROSPHÆRA DIFFUSA C. & P.

On *Desmodium Canadense*, Tick-trefoil. Burl., Sept. 1891; G. 837. Vernon, Sept. 1895; G. 347.

On *Desmodium Dillenii*. Burl., Sept. 1891; J. 838.

On *Desmodium nudiflorum*. Burl., Sept. 1897; O. 839.

MICROSPHÆRA ERINEOPHILA Pk.

On "erineum" caused by a *Phytoptus* (mite) on leaves of *Fagus ferruginea*, Beech. Newfane, Oct. 1892; G. 841.

MICROSPHÆRA GROSSULARIÆ (Wallr.) Lev.

On *Sambucus Canadensis*, Elder. Burl., Aug. 1890; C. 842. Johnson, Sept. 1893; G. 844. Beaver, Sept. 1897; O. 845.

On *Sambucus racemosa*. Newfane, Sept. 1892; G. 843.

MICROSPHÆRA QUERCINA (Schw.) Burrill.

On *Quercus alba*, White Oak. Burl., Oct. 1890; C. 847.

On *Quercus bicolor*, Swamp White Oak. Charlotte, Sept. 1897; O. 852.

On *Quercus rubra*, Red Oak. Common. Burl., Oct. 1890; C. 848. Newfane, Sept. 1892; G. 849.

MICROSPHÆRA RAVENELII Berk.

On *Vicia Cracca*, Vetch. Burl., Aug. 1896; G. 854.

MICROSPHÆRA RUSSELLII Clinton.

On *Oxalis cymosa*, Wood Sorrel. Newfane, Sept. 1892; G. 855. Burl., Aug. 1898; H. 1821. Walden, Aug. 1898; O. 1896.

MICROSPHÆRA VACCINII (Schw.) C. & P.

On *Epigaea repens*, Trailing Arbutus. Newfane, Oct. 1892; G. 856. Burl., May, 1895; J. 857.

On *Kalmia glauca*. Burl., Sept. 1896; J. 859.

PHYLLACTINIA SUFFULTA (Reb.) Sacc.

- On *Alnus incana*, Alder. Common. Burl., Oct. 1890; G. 372.
- On *Betula lutea*, Yellow Birch. Newfane, Sept. 1892; G. 861.
- On *Carpinus Caroliniana*, Blue Beech. Burl., Sept. 1891; C. 862.
- On *Celastrus scandens*, Bittersweet. Abundant. Burl., Sept. 1892; J. 863. Newfane, Oct. 1892; G. 864.
- On *Corylus rostrata*, Hazel-nut. Burl., Oct. 1897; O. 866.
- On *Fagus ferruginea*, Beech. Newfane, Oct. 1892; G. 867.
- On *Fraxinus pubescens*, Red Ash. Beaver, Sept. 1897; O. 868.
- On *Fraxinus* sp. Burl., Oct. 1890; C. 869.
- On *Hamamelis Virginiana*, Witch Hazel. Newfane, Sept. 1892; G. 870.
- On *Ostrya Virginica*, Lever-wood. Burl., Oct. 1890; C. 871.
- On paper in plant press. Newfane, Sept. 1892; G. 872.
- On *Ribes Cynosbati*, Gooseberry. Burl., Sept. 1897; O. 873.
- On *Sambucus Canadensis*, Elder. Burl., Oct. 1897; O. 874.

PODOSPHAERA BIUNCINATA C. & P.

- On *Hamamelis Virginiana*, Witch Hazel. Newfane, Oct. 1892; G. 875. Burl., Aug. 1896; G. 876.

PODOSPHAERA OXYCANTHAE (DC.) DeBy.

- On *Amelanchier Canadensis*, Service-tree. Abundant and sometimes seriously injurious. Burl., July, 1897; O. 878. Beaver, Sept. 1897; O. 879.
- On *Prunus* sp., Cherry. Burl., Aug. 1890; J. 371. Charlotte, July, 1898; Waugh, 1881.
- On *Spiraea salicifolia*, Meadow-sweet. Newfane, Sept. 1892; G. 581. Beaver, Sept. 1897; O. 881.
- On *Spiraea tomentosa*, Hardhack. Abundant. Newfane, Oct. 1892; G. 882. Beaver, Sept. 1897; O. 883.

SPHÆROTHECA CASTAGNEI Lev.

- On *Bidens frondosa*. Beaver, Sept. 1897; O. 884. Waterbury, Aug. 1898; O. 1879.
- On *Erechtites hieracifolia*, Fire-weed. Burl., Aug. 1898; H. 1880.
- On *Prenanthes altissima*. Burl., Sept. 1897; O. 885.
- On *Solidago juncea*, Golden Rod. Burl., Oct. 1897; O. 886.
- On *Taraxacum officinale*, Dandelion. Burl., Aug. 1890; J. 888. Walden, Aug. 1898; O. 1899.

SPHÆROTHECA HUMULI (DC.) Burrill.

On Agrimonia Eupatoria. Beaver, July, 1898; O. 1819.

On Geranium maculatum, Wild Cranesbill. Burl., June, 1893; Hinsdale, 891.

On Rubus odoratus, Flowering Raspberry. Abundant. Burl., Oct. 1890; C. 890. Beaver, July, 1898; O. 1820.

SPHÆROTHECA MALI (Duby.) Burrill.

On twigs of Pyrus Malus, Apple. Newfane, Oct. 1895; G. 894.

SPHÆROTHECA MORS-UVÆ (Schw.) B. & C.

On leaves and young shoots of Ribes sp., Gooseberry. Destructive. Burl., June, 1897; O. 742.

SPHÆROTHECA PANNOSA (Wallr.) Lev.

On Rosa humilis, Wild Rose. Burl., June, 1897; O. 896.

On Rosa rugosa. Charlotte, Sept. 1897; O. 897. Frequently quite injurious.

SPHÆROTHECA PRUINOSA C. & P.

On Rhus copallina, Dwarf Sumach, infested by mites. Vernon, Sept. 1895; G. 355.

UNCINULA CIRCINATA C. & P.

On Acer rubrum, Red Maple. Abundant. Sept. 1889; C. 898. Newfane, Oct. 1892; G. 899. Beaver, Sept. 1897; O. 901.

On Acer saccharinum, Sugar Maple. Newfane, Oct. 1892; G. 902.

On Acer spicatum, Mountain Maple. Burl., Oct. 1897; O. 904. Beaver, Sept. 1897; O. 903.

On Quercus alba, White Oak. Burl., Oct. 1890; C. 906.

UNCINULA CLINTONII Pk.

On Tilia Americana, Basswood. Burl., Sept. 1891; C. 907. Winooski, Sept. 1897; O. 910. Newfane, Sept. 1892; G. 908. Beaver, Sept. 1897; O. 909.

UNCINULA FLEXUOSA C. & P.

On Aesculus Hippocastanum, Horse Chestnut. Burl., Oct. 1890; J. 911.

UNCINULA MACROSPORA Pk.

On Ulmus Americana, Elm. Dummerston, Sept. 1895; G. 359.

UNCINULA NECATOR (Schw.) Burrill. (*U. spiralis*) (*U. ampelopsidis*.)

On Ampelopsis quinquefolia, Virginia Creeper. Abundant. Burl., Aug. 1890; J. 912. Charlotte, Sept. 1897; O. 913.

On Vitis sp., Grape. Pittsford, Sept. 1890; J. 361. Burl., Oct. 1890; J. 362. Newfane, Oct. 1892; G. 914.

Common, but not seriously injurious to the grape in this state.

UNCINULA SALICIS (DC.) Wint.

- On *Populus balsamifera*, Balsam Poplar. Burl., Aug. 1890; J. 915
- On *Populus tremuloides*, American Aspen. Newfane, Aug. 1892; G. 917.
- On *Salix alba* var. *vitellina*, Yellow Willow. Charlotte, Aug. 1897; O. 918.
- On *Salix cordata*, Willow. Burl., Oct. 1897; O. 919.
- On *Salix discolor*. Burl., Oct. 1897; O. 920.
- On *Salix humilis*. Burl., July, 1897; Flynn, 921.
- On *Salix myrtilloides*. Charlotte, Sept. 1897; O. 922.
- On *Salix* sp. Wardsboro, Sept. 1892; G. 923. Newfane, Sept. 1892; G. 596.

USTILAGINEAE.

DOASSANSIA OCCULTA var. *FARWELLII* Setchell.

- On fruits of *Potamogeton Pennsylvanicus*. Townshend. In Herb. A. J. Grout.

SPHACELOTHECA HYDROPIPERIS (Schum.) DeBy.

- In ovaries of *Polygonum sagittatum*. Burl., Oct. 1892; J. 1120. Johnson, Sept. 1893; G. 715. Newfane, Sept. 1892; G. 67. Waterbury, Aug. 1898; J. and O. 1882.

TILLETIA STRIAEFORMIS Westd.

- On leaves of *Calamagrostis Canadensis*, Blue-joint. Newfane, July, 1894; G. 58.

UROCYSTIS AGROPYRI (Preuss.) Schroet.

- On leaves of *Agropyron repens*, Witch-grass. Burl., June, 1891; J. 1214.

USTILAGO ANOMALA J. Kunze.

- In ovaries of *Polygonum dumetorum* var. *scandens*. Beaver, Sept. 1897; O. 1121.

USTILAGO AVENÆ (Pers.) Jensen.

- In ovaries of *Avena sativa*, Oat. Present to a greater or less degree in all oat fields. Often quite destructive, especially where western seed is used. Burl., July, 1894; J. 1122.

USTILAGO CARICIS (Pers.) Fuckel.

- In ovaries of *Carex* sp., Sedge. Johnson, July, 1893; G. 66.
- In ovaries of *Carex monile*. Burl., July, 1898; H. 1753.
- In ovaries of *Carex siccata*. Burl., July, 1898; H. 1754.
- In ovaries of *Carex sterilis*. Stratton, July, 1895; J. 1124.
- In ovaries of *Rhynchospora alba*. Newfane, Sept. 1892; G. 68.

USTILAGO HORDEI (Pers.) Kell. & Sw.

In ovaries of *Hordeum sativum*, Barley. Common. Burl., Sept. 1890; C. 1125.

USTILAGO LONGISSIMA (Sow.) Tul.

On leaves of *Glyceria grandis*. Johnson, July, 1894; G. 714. Burl., June, 1898; J. 1372.

USTILAGO MAYDIS (DC.) Corda.

On staminate and pistillate flowers of *Zea Mays*, Indian Corn. Burl., Aug. 1897; O. 1203. Common but not usually abundant enough to cause serious loss.

USTILAGO NEGLECTA Niessl.

In ovaries of *Setaria glauca*, Foxtail. Common. Burl., 1890; J. 1128. Newfane, Aug. 1892; G. 75.

USTILAGO SEGETUM (Bull.) Dittm.

On *Arrhenatherum avenaceum*, Tall Oat-grass. Abundant and injurious. Burl., June, 1898; J. & O. 1397.

USTILAGO TRITICI (Pers.) Jensen.

In ovaries of *Triticum vulgare*, Wheat. Not common. Burl., July, 1892; J. 1129.

USTILAGO UTRICULOSA (Nees.) Tul.

In ovaries of *Polygonum Pennsylvanicum*, Smartweed. Vernon, Sept. 1895; G. 84.

In ovaries of *Polygonum hydropiperoides*. Fuorna Mt., Sept. 1893; Eggleston, 1202.

USTILAGO VIOLACEA (Pers.) Fuckel.

In ovaries *Arenaria Grœnlandica*, Mountain Sandwort. Mt. Mansfield, Aug. 1898; J. 1878.

UREDINEÆ.**AECIDIUM ASTERUM** Schw.

On *Aster cordifolius*. Burl., July, 1897; O. 1216.

On *Aster corymbosus*. Burl., June, 1897; O. 1217.

AECIDIUM CLEMATIDIS DC.

On *Clematis Virginiana*, Virgin's Bower. Johnson, July, 1893; G. 1. Starksboro, June, 1895; J. 1218.

AECIDIUM COMPOSITARUM ~~Burt.~~ *Matt.*

On *Prenanthes* sp. Burl., July, 1898; O. 1790.

AECIDIUM EUPHORBIAE Gmel.

On *Euphorbia Preslii*. Usually accompanied by *Uromyces Euphorbiae* C. & P. Burl., Aug. 1891; J. 1219.

AECIDIUM FRAXINI Schw.

On *Fraxinus pubescens*, Red Ash. Burl., June, 1898; O. 1792.

AECIDIUM GNAPHALIATUM Schw.

On *Gnaphalium decurrens*. Newfane, Aug. 1892; G. 95.

AECIDIUM GROSSULARIÆ Schum.

On *Ribes Cynosbati*, Gooseberry. Burl., June, 1890; J. 1221.

On *Ribes floridum*. So. Hero, June, 1894; J. 1224.

On *Ribes prostratum*. Mt. Mansfield, June, 1897; O. 1225.

Occasionally injurious to cultivated gooseberries.

AECIDIUM HOUSTONIATUM Schw.

On *Houstonia cærulea*, Bluets. Johnson, June, 1895; G. 5.

AECIDIUM IMPATIENTIS Schw.

On *Impatiens fulva*, Jewel-weed. Burl., June, 1893; J. 1226.

AECIDIUM PECKII DeToni.

On *Oenothera biennis*, Evening Primrose. June, 1897; J. 1228.

AECIDIUM SAMBUCI Schw.

On *Sambucus Canadensis*, Elder, causing great distortion of petioles and young twigs. Burl., June, 1892; J. 1231.

CHRY SOMYXA PYROLÆ (DC.) Rostr. (*Uredo pyrolata*.) (*Cæoma pyrolatum*.)

II. On *Pyrola rotundifolia*. Abundant. Burl., May, 1890; J. 63.

COLEOSPORIUM CAMPANULAE (Pers.) Lev.

On *Campanula rapunculoides*, Bell-flower. Walden, Aug. 1898; White, 1906.

COLEOSPORIUM SONCHI (Pers.) Lev. (*C. Sonchi-arvensis* (Pers.) Lev.)

II. On *Aster lævis*. Burl., Oct. 1897; O. 1347.

On *Aster paniculatus*. Beaver, Sept. 1897; O. 1348. W. Rutland, Sept. 1897; Eggleston, 1349.

On *Aster macrophyllus*. Burl., Aug. 1890; J. 1350.

On *Aster* sp. Burl., Sept. 1896; O. 1351.

On *Solidago Canadensis*, Golden Rod. Burl., Aug. 1898; H. 1892.

On *Solidago juncea*. Burl., July, 1897; O. 1352.

On *Solidago puberula*. Burl., July, 1897; O. 1353.

On *Solidago rugosa*. Burl., 1890; G. 1354. Beaver, Sept. 1897; O. 1355.

On *Solidago serotina*. Burl., Aug. 1898; H. 1893.

On *Solidago* sp. Williston, Sept. 1890; J. 1356. Abundant everywhere on various species, and sometimes injurious to cultivated asters.

CRONARTIUM ASCLEPIADEUM (Willd.) Fr.

On *Myrica asplenifolia*, Sweet Fern. Burl., Aug. 1897; O. 1258.

Var. THESII Berk. (*C. Comandra* P.)

On *Comandra umbellata*. Burl., Aug. 1893; G. 7.

GYMNOSPORANGIUM CLAVIPES C. & P. (*Ræstelia aurantiaca*.)

I. On fruit of *Amelanchier alnifolia*, June-berry. Burl., Aug. 1897; O. 1337.

I. On fruit of *Amelanchier spicata*. Snake Mt., July, 1898; O. 1798.

GYMNOSPORANGIUM GLOBOSUM Farl. (*Ræstelia globosa*.)

I. On *Cratægus coccinea*, Hawthorn. Abundant. Burl., Oct. 1891; C. 1338.

I. On *Pyrus Americana*, Mountain Ash. Abundant. Burl., Oct. 1890; C. 1340.

III. On *Juniperus Virginiana*, Red Cedar. Abundant, producing large round swellings, or "cedar apples." Burl., May, 1891; J. 1341.

GYMNOSPORANGIUM MACROPUS Link. (*Ræstelia pirata*.)

I. On *Pyrus Malus*, Apple. South Hero, July, 1897; Waugh, 1342.

GYMNOSPORANGIUM NIDUS-AVIS Thaxter.

I. On *Amelanchier Canadensis*, Service-tree. Snake Mt., July, 1898; J. and O. 1795.

III. On *Juniperus Virginiana*, producing distorted growth or "witches' brooms." Burl., May, 1898; O. 1371.

ROESTELIA CORNUTI forma AMELANCHIERIS Wallr.

On *Amelanchier Canadensis*, Service-tree. Burl., Sept. 1897; O. 1336.

MELAMPSORA FARINOSA (Pers.) Schroet. (*M. salicina* Lev.)

II. On *Salix cordata*, Willow. Beaver, Sept. 1897; O. 1252.

II. On *Salix myrtilloides*. Charlotte, May, 1896; J. 1253.

II. On *Salix nigra*. Burl., Sept. 1897; O. 1254.

On *Salix* sp. Newfane, Sept. 1890; G. 727.

MELAMPSORA POPULINA (Jacq.) Lev.

II., III. On *Populus monilifera*, Cotton-wood. Common. Burl., Oct. 1890; J. 1255.

On *Populus tremuloides*, American Aspen. Newfane, Sept. 1892; G. 126.

MELAMPSORA SCOLOPENDRII (Fuckel.) Farl.

On *Onoclea sensibilis*. Williston, Sept. 1895; Tracy, 1796.

On *Osmunda Claytoniana*. Walden, Aug. 1898; O. 1895.

On *Woodwardia Virginica*. Burl., Aug. 1898; O. and H. 1903.

PERIDERMIUM DECOLORANS Pk.

I. On *Picea nigra*, Black Spruce. Burl., July, 1896; J. 325.

**PERIDERMUM PECKII** Thum.

On *Tsuga Canadensis*, Hemlock. Smuggler's Notch, Aug. 1898;
J. 1902.

PHRAGMIDIUM FRAGARIASTRI (DC.) Schroet. (*P. Fragariae*.)

II. On *Potentilla Canadensis*, Cinque-foil. Burl., Aug. 1897;
O. 1343.

II. On *Potentilla tridentata*, Snake Mt., July 1898; O. 1797.

PHRAGMIDIUM RUBI (Pers.) Wint.

II. On *Rubus hispidus*. Burl., Aug. 1898; O. 1905.

On *Rubus odoratus*, Flowering Raspberry. Johnson, Sept. 1894;
G. 13.

PHRAGMIDIUM RUBI-IDAEI (DC.) Karst.

II. On *Rubus strigosus*, Red Raspberry. Burl., Oct. 1890; C.
1344.

II. On *Rubus villosus*. Burl., Aug. 1898; O. 1898.

PHRAGMIDIUM SUBCORTICIUM (Schrank.) Wint. (*P. Mucronatum*.)

II. On *Rosa acicularis*, Wild Rose. Snake Mt., July, 1898; O. 1800.

II. On *Rosa blanda*. Burl., 1892; J. 1346.

II. On *Rosa humilis*, Snake Mt., July, 1898; O. 1799.

II., III. On *Rosa* sp, Newfane, Aug. 1892; G. 120.

Not uncommon and sometimes injurious.

PUCCINIA ANEMONES-VIRGINIANAE Schw.

III. On *Anemone Virginiana*. Vernon, July, 1895; G. 19.
Snake Mt., July, 1898; O. 1801. Providence Island, June, 1898;
H. and O., 1802.

PUCCINIA ANGUSTATA Pk.

On culms and leaves of *Eriophorum polystachyon*. Newfane, Oct.,
1892; G. 145.

On *Eriophorum cyperinum*. Newfane, Oct. 1892; In Herb. A.
J. Grout.

On *Scirpus atrovirens*. Burl., Aug. 1898; H. 1883.

PUCCINIA ASPARAGI DC.

III. On stems and branches of *Asparagus officinalis*, cultivated
Asparagus. Burl., Oct. 1897; Waugh, 1260.

A comparatively new disease, very destructive in the southern
states, which now occurs to a limited extent in Vermont, but which
may become general later.

PUCCINIA ASTERIS Duby.

- III. On *Aster corymbosus*. Burl., Aug. 1897; O. 1263.
- III. On *Aster macrophyllus*. Common. Stratton, Aug. 1894; G. 20.
- Snake Mt., July, 1898; O. 1803
- On *Aster cordifolius*. Newfane, In Herb. A. J. Grout.
- On *Aster acuminatus*. Stratton, In Herb. A. J. Grout.

PUCCINIA CARICIS (Schum.) Rebert.

- II. On *Carex canescens* var *alpicola*, Sedge. Mt. Mansfield, Aug. 1898; J. 1891.
- II. On *Carex gynandra*. Burl., July, 1898; H. 1887.
- II., III. On *Carex pallescens*. Burl., Aug. 1898; H. 1890.
- III. On *Carex Pennsylvanica*. Burl. 1898; H. 1901.
- III. On *Carex rigida* var *Bigelovii*, Mt. Mansfield. Aug. 1808; J. 1889.
- II. On *Carex tribuloides* var *Bebbii*. Burl., July, 1898; H. 1888.
- II., III. On *Carex* sp., Sedge. Common. Burl., Aug. 1890; J. 150.
- Beaver, Sept. 1897; O. 1266.
- II. On *Cyperus strigosus*. Aug., 1896; J. 1268.
- On *Dulichium spathaceum*. Newfane, Oct., 1892; G. 151.

PUCCINIA CIRCAEAE Pers.

- On *Circaea alpina*. Burl., Aug. 1891; J. 152. Waterbury, Aug. 1898; O. 1886.
- On *Circaea Lutetiana*. Newfane, Sept. 1892; G. 153. Providence Island, June, 1898; J. 1804. Snake Mt., July, 1898; O. 1805.

PUCCINIA CONVULVULI (Pers.) Cast.

- III. On *Convolvulus sepium*, Hedge Bind-weed. Burl., Oct. 1890; C. 1269. Newfane, Oct. 1892; G. 156.

PUCCINIA CORONATA Corda. (*Aecidium Rhamni*.)

- I. On *Rhamnus alnifolia*, Buckthorn. Burl., June, 1896; G. and J. 1270.
 - I. On *Rhamnus cathartica*. Burl., June, 1890; J. 1271.
 - III. On *Agropyron repens*, Witch-grass. Burl., Aug. 1897; O. 1273.
 - II., III. On *Avena sativa*, Oat. Burl., Aug. 1891; J. 1274.
- This rust of grasses is fairly abundant but not as injurious as the common rust, *Puccinia graminis*.

PUCCINIA EPILOBII DC.

- II. On *Oenothera biennis*, Evening Primrose. Burl., 1890; J. 1275.

PUCCINIA FUSCA Relhan.

- III. On *Anemone nemorosa*. Burl., May, 1890; J. 141.
- III. On *Anemone Virginiana*. Burl., May, 1897; O. 1278.

PUCCINIA GENTIANAE (Strauss) Link.

II. On *Gentiana quinqueflora*. Manchester. In Herb. A. J. Grout.

PUCCINIA GRAMINIS Pers. (*Aecidium Berberidis*.)

I. On *Berberis vulgaris*, Barberry. Common. Burl. May, 1890; J. 1280. Rupert, July, 1891; J. 165; E. Bethel, June, 1894; J. 1279.

II., III. On *Agropyron repens*, Witch-grass. Burl., Oct. 1892; J. 1281.

II. On *Agrostis vulgaris*, Red-top. Burl., July, 1898; H. 1824.

II., III. On *Avena sativa*, Oat. Burl., Sept. 1890; C. 1282.

III. On *Dactylis glomerata*, Orchard-grass. Burl., Oct. 1891; J. 1286.

II. On *Festuca pratensis*, Fescue. Burl., June, 1898; White, 1822.

III. On *Hordeum sativum*, Barley. Burl., Oct. 1890; C. 1287.

II. On *Poa pratensis*, Kentucky Blue-grass. Burl., July, 1898; H. 1823.

III. On *Triticum vulgare*, Wheat. Burl., Aug. 1891; J. 1288.

III. On *Secale cereale*, Rye. Burl., Aug. 1892; J. 1289.

Very common and injurious especially to cultivated oats.

PUCCINIA HIERACII (Schum.) Mart. (*P. flosculosorum*.) (*Uredo Hieracii*.)

On *Cichorium Intybus*, Chicory. Burl., Aug. 1898; H. 1888.

On *Cnicus arvensis*, Canada Thistle. Burl., Aug. 1890; J. 1291.

On *Prenanthes altissima*. Johnson, Sept. 1893; G. 27.

On *Taraxacum officinale*, Dandelion. Common. Burl., Aug. 1890; J. 26.

PUCCINIA IRIDIS (DC.) Wallr. (*Uredo Iridis* DC.)

On *Iris versicolor*, Blue Flag. Newfane; G. 733. Vernon, Sept. 1895; G. 42.

PUCCINIA MALVACEARUM Mont.

III. On *Althea rosea*, Hollyhock. Abundant and injurious. Burl., Aug. 1890; G. 1293. Woodstock, July, 1898; J. 1806.

On *Malva rotundifolia*, Mallow. Burl., July, 1898; H. 1825.

PUCCINIA MARIAE-WILSONI Clinton. (*Aecidium Claytoniatum*.)

III. On *Claytonia Caroliniana*, Spring Beauty. Burl., May, 1892; J. 1296.

I. On *Claytonia Virginica*. Burl., May, 1891; J. 2. Plainfield, May, 1890; J. 89.

PUCCINIA MENTHAE Pers.

On *Calamintha clinopodium*. Newfane, Oct. 1892; G. 184.

On *Monarda* sp. Stowe. In Herb. A. J. Grout.

On *Pycnanthemum* sp. Burl., Oct. 1890; G. 1297.

II., III. On *Pycnanthemum lanceolatum*. Rutland, Aug. 1897; Eggleston, 1298.

PUCCINIA PECKIANA Howe. (*Uredo caecoma nitens*.)

II. On *Rubus occidentalis*, Black Raspberry. Burl., June, 1891; C. 1363. III. Burl., Aug., 1896; G. 1299.

II. On *Rubus strigosus*, Red Raspberry. Burl., June, 1891; C. 1362.

II. On *Rubus villosus*. Blackberry. Colchester, June, 1894; J. 1364. III. Jamaica, Sept. 1890; G. 186. Stratton, Aug. 1894; G. 30.

The uredo stage of the fungus (*Caecoma nitens*) is abundant and destructive. The teleuto stage is not so common.

PUCCINIA PIMPINELLAE (Strauss.) Link.

II., III. On *Osmorrhiza brevistylis*, Sweet Cicely. Johnson, July, 1893; G. 1300. Shelburne, June, 1895; J. 1301.

PUCCINIA POLYGONI Pers. (*P. Polygoni-amphibii*.)

III. On *Polygonum Hartwrightii*. Burl., Oct. 1891; C. 1302. Vernon, Sept. 1895; G. 31.

II. On *Polygonum hydropiper*, Smartweed. Burl., Sept. 1897; O. 1304.

PUCCINIA PYROLAE Cooke.

III. On leaves and stems of *Polygala paucifolia*. Burl., Aug. 1897; O. 1305.

PUCCINIA SORGI Schw. (*P. Maydis*.)

II., III. On *Zea Mays*, Indian Corn. Burl., Aug. 1890; J. 1306. Starksboro, Sept. 1890; J. 34. Common but not very injurious.

PUCCINIA SUAVEOLENS (Pers.) Rostr.

II. On *Cnicus arvensis*, Canada Thistle. Burl., Oct. 1890; C. 1311.

PUCCINIA TANACETI DC. (*P. Helianthi*.)

II., III. On *Helianthus annuus*, Sunflower. Burl., Aug. 1890; J. 1314.

On *Helianthus decapetalus*. Townshend, Sept. 1892; G. 584.

III. On *Helianthus strumosus*. Burl., Aug. 1897; O. 1316.

Common and very destructive on the various wild and cultivated sunflowers.

PUCCINIA TENUIS Burrill.

On *Eupatorium ageratoides*. Johnson, July, 1893; G. 37.

PUCCINIA THALICTRI Chev.

III. On *Thalictrum Cornuti*. Burl., July, 1894; J. 1318.

PUCCINIA TIARELLAE B. & C.

On *Tiarella cordifolia*. Newfane, Oct., 1892; G. 213. Burl., Aug. 1897; O. 1319. Beaver, Sept. 1897; O. 1320.

PUCCINIA VIOLAE (Schum.) DC. (*Aecidium Violae* Schum.)

I. On *Viola Canadensis*, Violet. Burl., June, 1897; O. 1322. Mt. Mansfield, June, 1897; O. 1323.

I. On *Viola canina*. Burl., May, 1895; J. 1324.

I. On *Viola palmata*, var. *cucullata*. Burl., June, 1890; J. 1325.

III. Burl., Aug., 1890; J. 1329.

I. On *Viola pubescens*. Common and destructive. Burl., May, 1892; J. 1327.

II. On *Viola Selkirkii*. Johnson, July, 1893; G. 616.

I. On *Viola* sp. Fairfax, May, 1890; J. 1330. III. Newfane, Oct., 1892; G. 219.

PUCCINIA VIRGAUREAE (DC.) Libert.

III. On *Solidago* sp, Golden Rod. Burl., June, 1897; J. 1332.

PUCCINIA XANTHII Schw.

III. On *Xanthium Canadense*, Cockle-bur. Burl., July, 1895; J. 1333.

PUCCINIASTRUM EPILOBII (Chaill.) Otth. (*Melampsora Epilobii*.)

II. On *Epilobium adenocaulon*. Burl., Aug. 1898; O. 1904.

II. On *Epilobium angustifolium*. Burl., Aug. 1890; J. 1360, Newfane, Sept. 1892; G. 124.

TRIPHragMIUM CLAVELLOSUM Berk.

On *Aralia nudicaulis*, Sarsaparilla. Johnson, July, 1893; G. 39.

URED O AGRIMONIAE (DC.) Schroet. (*Caeoma Agrimoniae*.) (*Thecopsora Agrimoniae*.)

II. On *Agrimonia Eupatoria*. Abundant and apparently quite destructive. Burl., Sept. 1897; O. 1361. Newfane, Aug. 1892; G. 223. Snake Mt., July, 1898; O. 1810.

URED O POLYPODII DC. (*U. filicum*.)

On *Aspidium Thelypteris*. Johnson, Sept. 1893; G. 40.

On *Aspidium acrostichoides*. Johnson, Sept. 1894; G. 41.

On *Woodsia glabella*. Smugglers' Notch; Hinsdale. In Herb. A. J. Grout.

UROMYCES APPENDICULATUS (Pers.) Link. (*U. Phaseoli*.)

III. On Pods of *Phaseolus vulgaris*, Bean. Injurious. Woodstock, Aug. 1894; J. 1232.

UROMYCES CALADII (Schw.) Farl. (*Aecidium Caladii*.)

- I. On *Arisæma triphyllum*, Indian Turnip. Burl., June, 1891; C. 1236. II. III, Burl., Aug. 1890; J. 1237; Beaver, Sept. 1897; O. 1233. Snake Mt., July, 1898; J. 1808.

UROMYCES CARYOPHYLLINUS (Schrank) Schroet.

- II., III. On *Dianthus caryophyllus*, Carnation. Burl., Jan. 1893; Stevens, 238. Injurious in greenhouses.

UROMYCES DACTYLIDIS Otth. (*Aecidium Ranunculacearum* DC.)

- I. On *Anemone Virginiana*. Burl., June, 1895; J. 1229.

UROMYCES EUPHORBIE C. & P.

- II. On *Euphorbia Preslii*. Burl., Aug. 1897; O. 1237.
On *Euphorbia maculata*. Vernon, Sept. 1895; G. 46. Burl., Aug. 1898; O. 1897.

- III. On *Euphorbia* sp. Burl., Aug. 1892; J. 1236.

UROMYCES FABÆ (Pers.) DeBy.

- II. On *Vicia Cracca*, Vetch. Burl., Aug. 1895; J. 1238.

UROMYCES GERANII (DC.) Otth. & Wartm. (*Aecidium Geranii*.)

- I. On *Geranium maculatum*. So. Hero, June, 1894; J. 1239.

UROMYCES HEDYSARI-PANICULATI (Schw.) Farl.

- III. On *Desmodium Dillenii*, Tick-trefoil. Burl., Oct. 1890; C. 1240.

UROMYCES HYPERICI (Schw.) Curt.

- I., II., III. On leaves and stems of *Hypericum Canadense* var. *majus*, St. Johnswort. Newfane, Aug. 1892; G. 248. Beaver, Sept. 1897; O. 1243.

- III. On leaves and stems of *Hypericum mutilum*. Newfane, Aug. 1892; G. 247. Brattleboro, July, 1895; J. 1242.

UROMYCES JUNCII (Desm.) Tul.

- On stems of *Juncus* sp. Burl., Mar. 1893; J. 324.

UROMYCES LESPEDEZÆ (Schw.) Pk.

- I., II. On *Lespedeza capitata*. Burl., Aug. 1891; J. 1244. Guilford, Oct. 1892; G. 251.

UROMYCES LILLII Clinton.

- III. On *Lilium candidum*, Lily. Charlotte, June, 1896; J. 1246.

UROMYCES POLYGONI, (Pers.) Fuckel.

- II. On *Polygonum aviculare*, Knot-weed. Waterbury, Aug. 1898; O. 1885.

UROMYCES PYRIFORMIS Cooke.

- On *Acorus calamus*, Sweet Flag. Burl., Sept. 1896; G. 1247.

UROMYCES RHYNOSPORÆ Ell. & Gall.

- On *Rhynchospora alba*. Newfane; In Herb. A. J. Grout.

UROMYCES TEREBINTHII (DC.) Wint.

II., III. On *Rhus Toxicodendron*, Poison Ivy. Abundant and destructive. Burl., July, 1897; O. 1248. Snake Mt., July, 1898; O. 1809.

UROMYCES TRIFOLII (Hedw.) Wint.

III. On *Trifolium hybridum*, Alsike Clover. Burl., Sept. 1890; C. 1250. Charlotte, Aug. 1897; O. 1251.

III. On *Trifolium pratense*, Red Clover. Common and injurious. Burl., Oct. 1890; J. 259.

I., II. On *Trifolium repens*, White Clover. Burl., July, 1898; H. 1821.

**A PRELIMINARY LIST OF
THE HEPATICAЕ OF VERMONT**

By CLIFTON D. HOWE, A. B.

Published by the Botanical Department of the University of Vermont.

JANUARY, 1899,

NOTICE.

This pamphlet forms the third number of Contributions to the Botany of Vermont. The fourth number is already in press and the fifth will probably be ready for distribution some time during the coming summer. These contributions are prepared especially for Vermont students, but it is hoped that they will have some value to botanists in other sections, especially in the northeastern United States and in Canada. With this idea in mind the editions have been made sufficiently large so that they may be offered in exchange and for sale. Address,

Botanical Department, University of Vermont, Burlington, Vt.

CONTRIBUTIONS TO THE BOTANY OF VERMONT.

- I. A LIST OF THE MOSSES OF VERMONT, with Analytical Keys to the Genera and Species, by A. J. Grout, Ph. D.....38 pages, 15 cents
 - II. A PARTIAL LIST OF THE PARASITIC FUNGI OF VERMONT, by W. A. Orton, M. S.....24 pages, 10 cents
 - III. A PRELIMINARY LIST OF THE HEPATICE OF VERMONT, by Clifton D. Howe, A. B. 10 pages, 10 cents
 - IV. SUPPLEMENT TO A LIST OF THE MOSSES OF VERMONT, by A. J. Grout, Ph. D.....4 pages, 5 cents
- THE TREES OF VERMONT with Keys for their Determination. (Illustrated).
In preparation.

A PRELIMINARY LIST OF THE HEPATICAE OF VERMONT.

BY CLIFTON D. HOWE, A. B.

INTRODUCTION.

The first record of any extended study of Vermont Hepaticæ is found in a list* published in 1873 by Chas. C. Frost, of Brattleboro. The list contains 26 genera and 45 species of hepatics found in Vermont. Since 1873 this list has remained the only authority on Vermont hepatics, no one else having made a special study of them. In fact, Mr. Frost studied them only incidentally in connection with his more extended work upon mosses and fleshy fungi.

Unfortunately, Mr. Frost preserved no specimens of the hepatics upon which his list was based, or if he did preserve any such collection it has been lost or destroyed. A thorough search of his collection of fungi and other plants, now kept in the Brooks Library at Brattleboro, has failed to discover any specimens of hepatics. Inquiries of men who were associated with Mr. Frost, as well as investigations of the herbaria of all the New England colleges and of Columbia University and an advertisement in a leading botanical journal have all proved almost equally futile. The only representatives of Frost's collections which we have been able to find are ten specimens in the Yale College herbarium, and some of these are of species not included in his list. We are led to the conclusion that Frost did not systematically preserve specimens of hepatics. We are strengthened in this belief by the fact that it was not his custom to make herbarium specimens of many of the plants of the other groups in which he was more deeply interested than in the Hepaticæ.

Hepatics grow almost everywhere; on the ground in moist places, on rocks and stones about streams and on rotten logs and stumps. Some species are found on the bark of living trees, while others are especially abun-

* Frost, Chas. C. Catalogue of Cryptogamic Plants of Vermont. Archives of Science and Transactions of the Orleans Co. Society of Natural History. I: 194. 1873.

dant on the trees and fallen logs of swamps and bogs. Some of the thalloid forms of hepatics are frequently mistaken for lichens. The lichens, however, are usually dry and leathery and of dull color, usually not green, while hepatics are more loose and spongy in structure and of bright green color.

The foliaceous forms are moss-like in appearance and it is often difficult to distinguish them from true mosses without a microscope. Generally, however, they can be distinguished by the fact that the leaves of hepatics are two-ranked, one row on each side of the stem, while the leaves of mosses are in several or many ranks. The leaves of no foliaceous forms have a true mid-vein while in mosses this is usually present. The following table* will show briefly the distinctions between hepatics and mosses.

HEPATICÆ.	MUSCI.
I.—Plant body varying, in different species, from a thallus to a leafy axis.	I.—Plant body always a leafy axis.
II.—Stems bilateral, consisting of an upper and lower surface, distinct in appearance and structure.	II.—Stems not bilateral, uniformly developed.
III.—Leaves 2-ranked, often with rudiments of a third, never with a true mid-vein.	III.—Leaves 3-many-ranked (sometimes 2-ranked,) usually with a mid-vein.
IV.—Root hairs unicellular.	IV.—Root hairs usually composed of a row of cells.
V.—Calyptra remaining below at the base of the capsule which ruptures its upper portion.	V.—Calyptra ruptured at the base by the capsule which it covers as a cap.
VI.—Capsule maturing before rupturing the calyptra, usually opening by 2 or 4 valves, or irregularly.	VI.—Capsule maturing after rupturing the calyptra, usually opening by a special lid.
VII.—Columella wanting (except in <i>Anthocerotaceæ</i>).	VII.—Columella always present (at least in an early stage of development).
VIII.—Elaters mixed with the spores (except in <i>Ricciaceæ</i>).	VIII.—Elaters never present.

* Underwood, Lucien M. Descriptive Catalog of North American Hepaticæ. North of Mexico. Bull. Ill. State Lab. Nat. Hist. 2: 1884. Quoted with slight modifications.

This publication is made in the hope that it may encourage the making of further collections of Vermont Hepaticæ. The preparation of the appended lists represents intermittent periods of work extending over scarcely eighteen months, and yet it adds 20 species to Frost's list, making 65 species of Hepaticæ now reported from Vermont. My explorations have been confined to the vicinity of Newfane and Burlington. Those species in herbaria outside of the state were collected chiefly upon Mt. Mansfield and in the Willoughby Lake region by Messrs. Farlow, Faxon, and Pringle, mostly in connection with their work upon other cryptogamic plants. It is apparent, therefore, that only a small portion of the state has been explored for hepatics. Probably Frost's list of 45 species can be more than doubled by careful investigation of the more unexplored parts of the state. Our higher mountains, our lake shores, the southwestern corner of the state, our cedar swamps and cold bogs, particularly in the northern part of the state, probably all contain hepatics not yet listed. It is earnestly hoped that the botanists of the state will explore such promising localities as opportunity permits. I will gladly examine any specimens sent to me for identification.

Most of the specimens upon which this list is based may be found in the Herbarium of the University of Vermont numbered in correspondence with the citations in the list.

Where the nomenclature of the latest edition of Gray's Manual differs from that in current use, the synonym of the Manual is printed in italics after the name of the hepatic.

The preparation of this list was begun as undergraduate work for honors at the University of Vermont and has since been continued largely under the supervision of Prof. L. R. Jones of that University and of Dr. Marshall A. Howe of Columbia University. To both of these gentlemen I am greatly indebted for assistance and encouragement in the work. Acknowledgments are due also to Mr. C. G. Pringle for the loan of specimens, to Dr. A. W. Evans for correcting certain identifications, and to Dr. W. G. Farlow and Mr. C. E. Faxon for furnishing lists of the Vermont hepatics in their respective herbaria.

Newfane, Vt., December, 1898.

C. D. H.

ABBREVIATIONS.

The names of the collectors are abbreviated as follows :—

B.—F. Blanchard.

Far.—W. G. Farlow.

Fax.—Edwin Faxon and C. E. Faxon.

Fr.—Chas. C. Frost.

H.—Clifton D. Howe.

P.—C. G. Pringle.

Citation numbers refer to specimens in the herbarium of the University of Vermont.

JUNGERMANIACEÆ.

- Bazzania deflexa** (Mart.) Underw. Mt. Mansfield, *P.* 308; same in Fairbanks Museum and in Herb. Faxon; Mt. Mansfield, *Far.*, in Herb. Underwood and in Herb. Yale.
- Bazzania trilobata** (L.) S. F. Gray. Fr. list as *Mastigobryum trilobatum* Nees; Newfane, *H.* 12; Milton, A. J. Grout; Willoughby, *Fax.*
- Blasia pusilla** L. Newfane, *H.*; Underhill, *P.* 305; same in Herb. Faxon; Brattleboro, *Fr.*, in Herb. Yale as *Anthoceros punctatus* L. (determination corrected by Dr. Evans).
- Blepharostoma trichophyllum** (L.) Dumort. Fr. list as *Jungermania trichophylla* L.; Newfane, *H.* 130; Burlington, *H.* 34.
- Cephalozia bicuspidata** (L.) Dumort. N. Woodstock, *Fax.*, in Herb. Columbia.
- Cephalozia catenulata** (Hueben.) Spruce. Underhill, in Herb. Pringle as *Jungermania catenulata* Hueben.
- Cephalozia curvifolia** (Dicks.) Dumort. Fr. list as *Jungermania curvifolia* Dicks.; Burlington, Snake Mt., Newfane, *H.*; Charlotte, *P.* 131; Underhill, *P.* 390.
- Cephalozia media** Lindb. (*Cephalozia multiflora* Spruce) Fr. list as *Jungermania connivens* Dicks.; Burlington, Snake Mt., Newfane, *H.*; Willoughby, *Fax.*; Underhill, *P.* 180.
- Cephalozia Virginiana** Spruce. Underhill, *P.*; same in Herb. Faxon. (This specimen possibly should be referred to *C. catenulata*.)
- Frullania Asagrayana** Mont. Fr. list; Charlotte, *P.*; Stratton Mt., L. R. Jones.
- Frullania Eboracensis** Gottsche. Fr. list; Burlington, *H.* 44; Newfane, *H.* 52; Stowe, *P.* 169; Monkton, *P.* 352; Smuggler's Notch, *P.* 463; Waterbury Ctr., W. A. Orton, 1.
- Frullania Oakesiana** Aust. Mt. Mansfield, *Far.*, in Herb. Underwood and in Herb. Yale.
- Frullania Virginica** Gottsche. Fr. list; Charlotte, *P.* 2; Stowe, *P.*, in Herb. Faxon. (Dr. A. W. Evans of Yale University has referred to *F. Eboracensis* specimens collected by Mr. Pringle at Stowe, and distributed as *F. Virginica*. Since the specimens in Faxon's herbarium were collected by Pringle in the same locality only ten days before those which I sent to Dr. Evans, it is possible that they also are *F. Eboracensis*.)
- Geocalyx graveolens** (Schrad.) Nees. Snake Mt., *H.* 105.



THE HEPATICÆ OF VERMONT.

- Harpanthus scutatus** (Web.) Spruce. Newfane, *H.* 32; Charlotte, *P.*; Willoughby, *Fax.*
- Jubula Hutchinsiae** (Hook.) Dumort. var. **Sullivantii** Spruce. Brattleboro, *Fr.*, in Herb. Yale as *Frullania Tamarisci* Nees. Determination corrected by Dr. A. W. Evans.
- Jungermania attenuata** (Mart.) Lindenb. Mt. Mansfield, A. J. Grout; Jay Peak, *Fax.*, in Herb. Underwood. (As a variety of *J. barbata* in Manual but now made a species.)
- Jungermania barbata** Schreb. *Fr.* list; Mt. Mansfield, *Far.*; Brattleboro, *Fr.*, in Herb. Yale.
- Jungermania bicrenata** Schmid. Andover, *Far.*, in Herb. Yale. "Apparently *J. excisa* of the Manual," *vide* Dr. Evans.
- Jungermania Michauxii** Weber. Mt. Mansfield, *P.*; same in Herb. Faxon; Mt. Mansfield, *Fax.* in Herb. Yale as *J. minuta*, (determination corrected by Dr. Evans.)
- Jungermania quinquidentata** Huds. Mt. Mansfield, *Far.*, in Herb. Underwood, *vide* Dr. Evans.
- Jungermania Schraderi** Martius. *Fr.* list; Newfane, *H.* 31; Charlotte, *P.* 106; same in Herb. Faxon; West Danville, *B.*, in Fairbanks Museum; Brattleboro, *Fr.*, in Herb. Yale.
- Jungermania setiformis** Ehrh. Mt. Mansfield, *Far.*, in Herb. Underwood and Herb. Yale.
- Jungermania ventricosa** Dicks. Mt. Mansfield, *P.*; Mt. Mansfield, E. G. Knight, in Herb. Columbia and *Far.* in Herb. Underwood.
- Kantia Trichomanis** (L.) S. F. Gray. *Fr.* list as *Calypogeia Trichomanis* Corda. Newfane, *H.* 18; Burlington, *H.* 49.
- Lejeunea serpyllifolia** (Dicks.) Libert, var. **Americana** Lindb. *Fr.* list; Snake Mt., *H.* 111; Lake Dunmore, *Far.*
- Lepidozia reptans** (L.) Dumort. *Fr.* list; Burlington, *H.* 35; Newfane, *H.* 36.
- Lophocolea heterophylla** (Schrad.) Dumort. Newfane, Snake Mt., Burlington, *H.* 51; Smuggler's Notch, *P.*; Charlotte, *P.* 132.
- Lophocolea minor** Nees. Burlington, Newfane, *H.* 4; Ferrisburg, *Fax.*; Headlands, Shelburne Point, *P.*; same in Herb. Faxon; Lake Champlain, *Fax.*, in Herb. Underwood.
- Marsupella emarginata** (Ehrh.) Dumort. *Fr.* list as *Sarcoscyphus Ehrharti* Corda. Mt. Mansfield, *Far.*, in Herb. Underwood and Herb. Yale.

- Metzgeria conjugata** Lindb. Probably the *M. furcata* of Frost's list. Snake Mt., *H.* 118; Mansfield Pass Cliffs, *P.*; same in Herb. Faxon.
- Mylia Taylori** (Hook.) S. F. Gray. Mt. Mansfield, *Far.*, in Herb. Yale.
- Odontoschisma denudata** (Nees.) Dumort. Lake Dunmore, *Far.*
- Pellia epiphylla** (L.) Corda. Fr. list; Newfane, Burlington, *H.* 25; Underhill, *P.*; Peacham, *B.* in Fairbanks Museum; Johnson, A. J. Grout.
- Plagiochilia asplenioides** (L.) Dumort. Fr. list; Newfane, *H.* 304; Wardsboro, M. A. Howe, 20; Mt. Mansfield, *Far.*; Willoughby Lake, *Fax.* in Herb. Underwood. The entire-leaved *P. porelloides* (Torr.) Lindenb., which Dr. Evans and some others think not entitled to specific distinction, occurs, as well as the dentate-leaved form (typical *P. asplenioides*.)
- Porella pinnata** L. Fr. list as *Madotheca porella* Nees.; Monkton, Hinesburg, *P.*; Brattleboro, *Fr.*, in Herb. Yale.
- Porella platyphylla** (L.) Lindb. Fr. list as *Madotheca platyphylla* Dumort.; Burlington, *H.* 29; Snake Mt., *H.*; Newfane, *H.* 7; Charlotte, *P.* 129; Monkton, *P.* 342; Hinesburg, *P.*; Waterbury Ctr., W. A. Orton, 2; Willoughby, *Fax.*; Ferrisburg, *Fax.*; Ryegate, *B.* in Fairbanks Museum; Stowe, E. G. Knight (Mrs. E. G. Britton) in Herb. Columbia; Ferrisburg, *Fax.* in Herb. Underwood.
- Ptilidium ciliare** (L.) Nees. Fr. list; Burlington, Newfane, *H.* 9; Johnson, A. J. Grout, 1; Charlotte, *P.* 132; Underhill, *P.* 184; Willoughby, *Fax.*; Peacham, *B.* in Fairbanks Museum; Stowe, Mt. Mansfield, E. G. Knight, in Herb. Columbia.
- Radula complanata** (L.) Dumort. Fr. list; Snake Mt., Newfane, Burlington, *H.* 48; Charlotte, *P.* 117; Peacham, *B.* in Fairbanks Museum; Wells River and Willoughby Lake, *Fax.*; Wells River, *Far.*, in Herb. Underwood; Stowe, *Far.* and Brattleboro, *Fr.*, in Herb. Yale.
- Riccardia latifrons** (Lindb.) Lindb. (*Aneura latifrons* Lindb.) Fr. list as *A. palmata*, Nees.; Brattleboro, *Fr.*, in Herb. Yale.
- Scapania nemorosa** (L.) Dumort. Fr. list; Wardsboro, *H.* 21; Bakersfield, *P.* 377; Underhill, *P.* 386; Jay Peak, *Fax.*
- Scapania undulata** (L.) Dumort. Newfane, *H.* 10; Mt. Mansfield, E. G. Knight, in Herb. Columbia.
- Trichocolea tomentella** (Ehrh.) Dumort. Fr. list; Newfane, *H.*; Waterbury, W. A. Orton, 3; Burlington, A. J. Grout, 5; Starksboro, *P.*; Sutton and Willoughby *Fax.*, in Herb. Underwood.

MARCHANTIACEÆ.

- Asterella tenella** (L.) Pal. de Beauv. (*Fimbriaria tenella* Nees.) Fr. list; Williamstown Gulf and Willoughby, *Fax.*; Peacham, *B.*, in Fairbanks Museum.
- Conocephalus conicus** (L.) Dumort. Fr. list as *Fegatella conica* Corda. Newfane, *H.*; Waterbury Ctr., W. J. Morse, 1; Williamstown, Willoughby, *Fax.*; West Barnet, *B.*, in Fairbanks Museum; Williamstown, *Fax.*, in Herb. Underwood; Brattleboro, *Fr.* in Herb. Yale; Johnson, Mt. Mansfield, A. J. Grout.
- Grimaldia fragrans** (Balbis) Corda. (*Grimaldia barbifrons* Bisch.) Willard's Ledge, Burlington, L. R. Jones, 6; Brattleboro, *Fr.* In Herb. Yale as *Fimbriaria tenella* Nees. "These specimens [Frost's] are scanty and sterile but are apparently *Grimaldia*."—Dr. Evans.
- Marchantia polymorpha** L. Fr. list; Newfane, *H.*; Bristol, *P.* 197; Johnson, L. R. Jones, 4; Peacham, *B.*, in Fairbanks Museum.
- Preissia commutata** Nees. Burlington, *H.* 65; Brattleboro and Smuggler's Notch, L. R. Jones, 5; Stowe, A. J. Grout, 2; Bakersfield Cliffs, *P.*; Williamstown and Willoughby, *Fax.*
- Reboulia hemisphaerica** (L.) Raddi. (*Asterella hemisphaerica* Pal. de Beauv.) Fr. list; Burlington, L. R. Jones, 7; Sawyer's Island, Lake Champlain, *P.*; same in Herb. Faxon; West Windsor, *B.*, in Fairbanks Museum.

RICCIACEÆ.

- Riccia finitans** (L.) Fr. list; Castleton Pond, W. W. Eggleston.
- Riccia lutescens** L. Fr. list; Brattleboro, *Fr.* (The only hepatic found while searching Frost's collections in the Brooks Library at Brattleboro.)
- Ricciocarpus natans** (L.) Corda. (*Riccia natans* L.) Fr. list; Round Pond, So. Hero, L. R. Jones, 8; Windsor, *B.*, in Fairbanks Museum.

INTRODUCED SPECIES.

- Lunularia cruciata** (L.) Dumort. (*Lunularia vulgaris* Raddi.) In greenhouse, Burlington, *H.* 70.

INSERTED ON THE AUTHORITY OF FROST'S LIST ALONE.

Anthoceros lævis L.

Anthoceros punctatus L.

Cephalozia divaricata (Sm.) Dumort, as *Jungermania divaricata* Smith.

Chiloscyphus polyanthos (L.) Corda.

Frullania Tamarisci (L.) Nees.

Jungermania excisa Dicks. var. **crispa** Hook, as *J. intermedia* Lindb.

Jungermania exsecta Schmid.

Lepidozia setacea Mitt. as *Jungermania setacea* Weber.

Lophocolea bidentata (L.) Dumort.

Nardia crenulata (Sm.) Lindb.; as *Jungermania crenulata* Smith.

Riccardia multifida (L.) S. F. Gray. (*Aneura multifida*. Dumort.)

Riccia Sullivantii Aust. (Now considered a variety of *R. fluitans*.)

Photo
Pam
Bind
Gaylord B
Mak
Stockton
PAT. JAN. 2

789396
Vermont. University.
Botanical dept.
Contributions to the
botany of Vermont

V5
no.1-3

BIOLOGY
LIBRARY
G

789396

Q1190

V5

v.1-3

BIOLOGY
LIBRARY
G

UNIVERSITY OF CALIFORNIA LIBRARY

